EXHIBIT 4

APPENDIX A

APPENDIX A: IETF Standards and Publications

1. I have reviewed Arista's responses, including supplemental responses to Cisco's Interrogatory No. 10 and incorporate the identification of IETF publications and other industry-standard documents cited in those responses for the disputed CLI commands.

A. Authentication, Authorization, and Accounting ("AAA") Protocols

2. Authentication, Authorization, and Accounting, or AAA, is a networking industry term that refers to a protocol or framework for managing access to computer resources, enforcing network policies (including security policies), auditing network usage, and providing data for use in billing for network services.

3. Per Cisco's own background on AAA, the phrase "authentication, authorization, and accounting" was first used as a discrete term as early as 1983 in an IEEE paper (Lagsford et. al., "OSI Management and Job Transfer Services," *Proceedings of the IEEE,* Volume 71, No. 12, December 1983.) and the ordering of the "As" in the Lagsford publication remains the same in today's usage. *See* http://www.cisco.com/c/en/us/about/press/internet-protocol-journal/back-issues/table-contents-35/101-aaa-part1.html.

4. The IETF describes several AAA standardized protocols, including RADIUS (RFCs 2058, 2138, and 2865) and Diameter (RFC 6733), as well as several proposed AAA protocols that were not ratified as IETF standards, including TACACS (Terminal Access Controller Access Control System) and TACACS+ (a version of TACACS developed by Cisco, and described in an IETF Informational publication).

5. Generally speaking, an AAA protocol is an IP protocol used to transport AAA

related information between the AAA client and the AAA server, but does not typically cover protocols used between the host and the AAA client.

6. The "Authentication" in AAA refers to the process of identifying a user based on unique criteria, such as checking for a valid user name and valid password, before access is granted to the system or network. The "Authorization" in AAA refers to the process of determining the types or qualities of activities, resources, or services a user is permitted to access. This may involve, for example, determining whether the user has authority to issue certain commands, or may access certain resources in the system or network. The "Accounting" in AAA refers simply to the tracking of resources a user consumes while accessing the system or network, such as the amount of data a user may send or receive over the network. Accounting data can be used for billing, resource management, and capacity planning, and other statistical analyses.

a. Remote Authentication Dial In User Service ("RADIUS")

7. RADIUS is the acronym for Remote Authentication Dial In User Service, which is an AAA protocol developed by Merit Network in 1991 before it was described in RFC 2058 (a standards-track IETF RFC) in January 1997, entitled "Remote Authentication Dial In User Service (RADIUS)". Several subsequent standards-track RFCs followed, including RFC 2138 (Apr. 1997) and RFC 2865 (June 2000). RADIUS follows a simple client/server model that uses UDP transport.

b. Terminal Access Controller Access Control System ("TACACS")

8. TACACS (pronounced "tack-axe") is the acronym for Terminal Access Controller Access Control System, which is an AAA protocol described in RFC 1492, an

Informational RFC, entitled "An Access Control Protocol, Sometimes Called TACACS" and published in July 1993 by C. Finseth from the University of Minnesota. As RFC 1492 discusses, the original TACACS protocol dates back to the ARPANET in the 1980s.

9. TACACS allows a client to accept a username and password and send a query to a TACACS authentication server, which is also called a TACACS daemon. The authentication server would then determine whether to accept or deny the authentication request.

10. Many additional RFCs discuss AAA, including RFC 2903 ("Generic AAA Architecture") (Aug. 2000), RFC 2904 ("AAA Authorization Framework") (Aug, 2000), and several others listed and available for viewing to the public on the IETF website. *See, e.g.*, https://datatracker.ietf.org/doc/search/?name=AAA&activedrafts=on&rfcs=on. While some of these RFCs are Informational or Experimental, others are Proposed Standards and Best Current Practices RFCs.

11. The following CLI commands in this litigation provide functionality relating to AAA protocols, including both RADIUS and TACACS (shown in chronological order based on Cisco's purported "earliest document date" for each alleged command):

Disputed "Command"	Earliest Document Date	Additional Opinions[1]
tacacs-server host	April 24, 1989	As explained in RFC 1492, TACACS dates back to the ARPANET in the 1980s, before the term was used in this command.

[1] For all portions of this Appendix, these additional opinions are intended to provide further facts and opinions showing the use in industry standards, or the general use in the networking industry and users of networking equipment, of words found in the disputed commands prior to the command's purported creation by Cisco. The additional opinions are intended to apply to all disputed commands that might use the same words and phrases (for example, an opinion about the term "aaa" will not be repeated next to all commands in which that term appears).

		TACACS authentication servers are discussed in RFC 1492 (July 1993), and the term "TACACS+ server" is used in IETF Internet Draft "The TACACS+ Protocol Version 1.78" (Jan. 1997). The general requirement of AAA servers is also discussed in RFC 2903.
tacacs-server timeout	September 14, 1989	RFC 1492 (July 1993) uses the common industry term "timeout" in the context of TACACS (using the term "idle timeout"). Moreover, the IETF Internet Draft "The TACACS+ Protocol Version 1.78" (Jan. 1997) defines "timeout" as "an absolute timer for the connection (in minutes). A value of zero indicates no timeout."
aaa accounting	November 15, 1994	"accounting" is one of the three A's of AAA, and has been since at least 1983.
aaa authentication login	November 15, 1994	"authentication" is one of the three A's of AAA, and has been since at least 1983. The use of logins for authentication is discussed in RFC 2989 § 2.3 ("Authorization Requirements").
radius-server host	May 4, 1995	The terms "radius" and "radius server" are used in RFC 2058 (Jan. 1997), and the Introduction of that RFC describes Radius as a client/server application, and

		expressly uses the term "RADIUS server." The general requirement of AAA servers is also discussed in RFC 2903. Term "radius-server" refers to the server responsible for radius authentication. The term "host" refers to the identity of the appliance acting as a radius server (*i.e.* hostname or ip address). "Host" is described in RFC 1514 (Sept. 1993).
radius-server key	May 4, 1995	The term "key" refers to password used to authenticate radius messages from valid users, and is a common industry term to refer to a unique authentication value, like a password. RFC 2058 (Jan. 1997) Section 2.1 uses "secret key" in this manner.
radius-server retransmit	May 4, 1995	Term "retransmit" refers to the number of attempts a radius client should try before cancelling a radius request. This is discussed in RFC 2058 (Jan. 1997) Section 2. RFC 2618 (June 1999) also defines a variable relating to RADIUS Access-Request packet retransmission.
radius-server timeout	May 4, 1995	Term "timeout refers to the amount of time a radius client should wait

		for a reply from a server. This is discussed in RFC 2058 (Jan. 1997) Section 2. RFC 2618 (June 1999) defines a RADIUS timeout variable.
ip tacacs source-interface	December 8, 1995	"ip" was defined in RFC 791, long before this command was introduced into Cisco. IP is discussed elsewhere in this report.
ip radius source-interface	January 1, 1996	The term "source-interface" refers descriptively to the function of overriding the source IP address for all radius packets transmitted.
tacacs-server key	February 1, 1996	The IETF Internet Draft "The TACACS+ Protocol Version 1.78" (Jan. 1997) at Section 5 discusses the use of a "key" for encryption. This is analogous to the "key" used for RADIUS servers, and is a common term in the AAA context.
show tacacs	February 9, 1996	"show" commands come from prior legacy CLIs, as discussed elsewhere in this Report. TACACS is an industry defined acronym as shown in RFC 1492 (July 1993).
radius-server deadtime	June 3, 1996	The term "deadtime" refers to the amount of time a server is bypassed when it is unavailable for a radius transaction (transactions are handled by a secondary radius server). *See* RFC 2058 at Section 2.
aaa authorization config- commands	December 10, 1996	"authorization" is one of the three A's of AAA, and has been since at

		least 1983.
aaa group server radius	May 5, 1998	As discussed above, RADIUS is a type of AAA protocol.
aaa group server tacacs+	May 5, 1998	As discussed above, TACACS is a type of AAA protocol. "tacacs+" and "tacacs+ server" are both described in "The TACACS+ Protocol" (Informational IETF publication) (Jan. 1997)
aaa authorization console	July 15, 1999	Constituent command keywords discussed elsewhere in this table and section. "Console" as used in this context refers to the console connection, and so would enable authorization entered through the console (as opposed to entered via some other connection type). This use of "console" in this and other disputed commands uses the familiar industry meaning of the term to user.
show aaa method-lists	June 12, 2000	"show" commands come from prior legacy CLIs, as discussed elsewhere in this Report. RFC 2058 § 1 describes that "[t]he RADIUS server can support a variety of methods to authenticate a user."
show aaa sessions	September 29, 2000	RFC 2989 § 2.3 describes "session records" and RFC 6065 § 4.1 describes ""A unique identifier is needed for each AAA-authorized

		'session', …."
aaa accounting dot1x	March 29, 2006	"dot1x" refers to the 802.1X standard. The IEEE standard itself uses the term "dot1x". *See* IEEE Std 802.1X-2001 (Sept. 2001) (discussed elsewhere in this Report). RFC 3580 § 1 (Sept. 2003) discusses AAA for IEEE 802 networks.
show radius	November 14, 2006	Constituent command keywords discussed elsewhere in this table and section.

B. Address Resolution Protocol ("ARP")

12. Address Resolution Protocol, or ARP, is described in RFC 826, which is titled "An Ethernet Address Resolution Protocol -- or -- Converting Network Protocol Addresses to 48 bit Ethernet Address for Transmission on Ethernet Hardware" and was published in November 1982. David C. Plummer from MIT is identified as the author of RFC 826.

13. ARP provides a mechanism to enable a host to determine a receiver's MAC address based solely on the IP address. The Internet Assigned Numbers Authority (IANA), which is an entity responsible for the global coordination of the DNS Root, IP addressing, and other Internet protocol resources including Internet protocols' numbering systems, maintains a list of all ARP parameters. *See* http://www.iana.org/assignments/arp-parameters. More information about the IANA and its authority is available on the IANA's website at http://www.iana.org/about.

14. ARP as described in RFC 826 has been addressed and/or updated by

subsequent RFCs, including RFC 5227, entitled "IPv4 Address Conflict Detection" and published in July 2008, and RFC 5494, entitled "IANA Allocation Guidelines for the Address Resolution Protocol (ARP)" and published in April 2009.

15. The following CLI commands in this litigation provide functionality relating to the ARP standard (shown in chronological order based on Cisco's purported "earliest document date" for each alleged command):

Disputed "Command"	Earliest Document Date	Additional Opinions
show arp	July 20, 1986	"show" commands come from prior legacy CLIs, as discussed elsewhere in this Report. "Address Resolution Protocol" appears in RFC 826 (Nov. 1982), and the acronym "ARP" is first used in RFC 925 (Oct. 1984).
clear arp-cache	July 20, 1986	RFC 1620 § 5 ("Security Considerations") describes: "This validation, involving both routing and ARP caches, ..."
ip proxy-arp	September 14, 1989	"IP" was described in RFC 791 (1981), as discussed elsewhere in this Report. RFC 1009 § 2.4 ("Address Resolution Protocol (ARP)") (1987) describes: "A variation on this procedure, called 'proxy ARP', has been used by gateways attached to broadcast LANs …" RFC 1027 (1987) similarly describes: "This RFC describes the

		use of the Ethernet Address Resolution Protocol (ARP) by subnet gateways to permit hosts on the connected subnets to communicate without being aware of the existence of subnets, using the technique of 'Proxy ARP'"
show ip arp	December 1992	Constituent command keywords discussed elsewhere in this table and section.
arp timeout	1993	The "timeout" for ARP is discussed in RFC 826 (Nov. 1982).
ip local-proxy-arp	March 13, 2001	Constituent command keywords discussed elsewhere in this table and section.
clear ip arp	April 21, 2008	"clear" commands come from prior legacy CLIs, as discussed elsewhere in this Report.

C. Bidirectional Forwarding Detection ("BFD")

16. Bidirectional Forwarding Detection, or BFD, was first described in a standards-track Internet Draft by the IETF Network Working Group in July 2004 by D. Katz from Juniper Networks and D. Ward from Cisco Systems. The first Internet Draft, entitled "Bidirectional Forwarding Detection … draft-ietf-bfd-base-00.txt" was followed by eleven subsequent drafts over the next six years, culminating in RFC 5880, which is titled "Bidirectional Forwarding Detection (BFD)" and published in June 2010 by Katz and Ward (both at Juniper Networks at the time).

17. Related standards-track RFCs describing BFD functionality include RFC 5881,

which is titled "Bidirectional Forwarding Detection (BFD) for IPv4 and IPv6 (Single Hop)" and published in June 2010 by Katz and Ward, and RFC 7331, which is titled " Bidirectional Forwarding Detection (BFD) Management Information Base" and published in August 2014 by contributors from Cisco and Brocade Communications.

18. As described in RFC 5880, BFD is a standardized protocol used to provide low overhead, short duration fault detection in the bidirectional path between two forwarding engines (*e.g.*, routers), including interfaces, data link(s), and to the extent possible the forwarding engines themselves.

19. The following CLI commands in this litigation provide functionality relating to the BFD standard (shown in chronological order based on Cisco's purported "earliest document date" for each alleged command):

Disputed "Command"	Earliest Document Date	Additional Opinions
show bfd neighbors	December 22, 2003	"show" commands come from prior legacy CLIs, as discussed elsewhere in this Report. "BFD" and the term "neighbors" in a BFD context first appeared in IETF Internet Drafts entitled "Bidirectional Forwarding Detection" (June 2003–May 2004) For example, IETF Internet Draft ("Bidirectional Forwarding Detection") (June 2003) § 3 says: "Each system estimates how quickly it can send and receive BFD packets in order to come to an agreement with its neighbor about how rapidly

		detection of failure will take place."
bfd all-interfaces	May 26, 2004	Constituent command keywords discussed elsewhere in this table and section. "Interfaces" (as well as "interface") is used in this command and other disputed commands in its customary meaning to CLI users in the networking industry--namely, in reference to the different types of interfaces than can be supported by the switch.
neighbor fall-over bfd	June 10, 2005	"neighbor" in this context is a BGP, RFC 1105 (June 1989) introduced and discussed the the concept of a BGP "neighbor" in Section 4 ("BGP_Idle state: … In this state BGP refuses all incoming BGP connections. No resources are allocated to the BGP neighbor."). RFC 1164 (June 1990) further discussed "BGP Neighbor Relationships" and used the term "neighbor" in the BGP context throughout.

D. Border Gateway Protocol ("BGP")

20. Border Gateway Protocol, or BGP, is described in RFC 1105, which is titled "A Border Gateway Protocol (BGP)" and was published in June 1989. Kirk Lougheed from Cisco Systems and Yakov Rekhter from IBM's T.J. Watson Research Center are identified on RFC 1105 as authors. The current version of BGP is version 4, which is described in RFC

4271 (a standards-track RFC), entitled "A Border Gateway Protocol 4 (BGP-4)" and published in January 2006. RFC 4271 lists Mr. Rekhter (of Juniper Networks at the time), Anthony Li, and Susan Hares (of NextHop Technologies at the time) as editors. RFC 4271 is based on RFC 1771, which also described BGP version 4. RFC 1771 was published in March 1995, shared the same title as RFC 4271, and listed Mr. Rekhter (of IBM at the time) and Mr. Li (of Cisco at the time) as editors.

21. There are many other RFCs that describe BGP functionality, including:

- RFC 1163 (June 1990), entitled "A Border Gateway Protocol (BGP)"
- RFC 1164 (June 1990), entitled "Application of the Border Gateway Protocol in the Internet"
- RFC 1267 (Oct. 1991), entitled "A Border Gateway Protocol 3 (BGP-3)"
- RFC 1268 (Oct. 1991), entitled "Application of the Border Gateway Protocol in the Internet"
- RFC 1269 (Oct. 1991), entitled "Definitions of Managed Objects for the Border Gateway Protocol (Version 3)"
- RFC 1397 (Jan. 1993), entitled "Default Route Advertisement in BGP2 and BGP3 Versions of the Border Gateway Protocol"
- RFC 1654 (July 1994), entitled "A Border Gateway Protocol 4 (BGP-4)"
- RFC 1655 (July 1994), entitled "Application of the Border Gateway Protocol in the Internet"

- RFC 1657 (July 1994), entitled "Definitions of Managed Objects for the Fourth Version of the Border Gateway Protocol (BGP-4) using SMIv2"
- RFC 1771 (Mar. 1995), entitled "A Border Gateway Protocol 4 (BGP-4)"
- RFC 1965 (June 1996), entitled "Autonomous System Confederations for BGP"
- RFC 1966 (June 1996), entitled "BGP Route Reflection - An Alternative to Full Mesh IBGP"
- RFC 1997 (Aug. 1996), entitled "BGP Communities Attribute"
- RFC 1998 (Aug. 1996), entitled "An Application of the BGP Community Attribute in Multi-home Routing"
- RFC 2283 (Feb. 1998), entitled "Multiprotocol Extensions for BGP-4"
- RFC 2385 (Aug. 1998), entitled "Protection of BGP Sessions via the TCP MD5 Signature Option"
- RFC 2535 (Mar. 1999), entitled "Use of BGP-4 Multiprotocol Extensions for IPv6 Inter-Domain Routing"
- RFC 2796 (Apr. 2000), entitled "BGP Route Reflection - An Alternative to Full Mesh IBGP"
- RFC 2858 (June 2000), entitled "Multiprotocol Extensions for BGP-4"
- RFC 2918 (Sept. 2000), entitled "Route Refresh Capability for BGP-4"
- RFC 3065 (Feb. 2001), entitled "Autonomous System Confederations

for BGP"

- RFC 4098 (June 2005), entitled "Terminology for Benchmarking BGP Device Convergence in the Control Plane"
- RFC 4271 (Jan. 2006), entitled "A Border Gateway Protocol 4 (BGP-4)"
- RFC 4360 (Feb. 2006), entitled "BGP Extended Communities Attribute"
- RFC 4273 (Jan. 2006), entitled "Definitions of Managed Objects for BGP-4"
- RFC 4456 (Apr. 2006), entitled "BGP Route Reflection: An Alternative to Full Mesh Internal BGP (IBGP)"
- RFC 4760 (Jan. 2007), entitled "Multiprotocol Extensions for BGP-4"
- RFC 5065 (Aug. 2007), entitled "Autonomous System Confederations for BGP"

22. BGP is an exterior gateway protocol that is used to provide routing information between Internet routing domains (or between different Autonomous Systems, or ASs). It is also referred to as an inter-autonomous system routing protocol. The IANA maintains a list of BGP parameters at http://www.iana.org/assignments/bgp-parameters/bgp-parameters.xhtml.

23. The following CLI commands in this litigation provide functionality relating to the BGP standard (shown in chronological order based on Cisco's purported "earliest document date" for each alleged command):

Disputed "Command"	Earliest Document Date	Additional Opinions

"BGP" first appears in RFC 1105 (June 1989); several other RFCs discussing BGP followed in the early 1990s before the "earliest document dates" below.		
neighbor weight	September 14, 1989	RFC 1268 (Oct. 1991) described the assignment of "weights" to Autonomous Systems in Section 6. RFC 1164 (June 1990) further discussed "BGP Neighbor Relationships" and used the term "neighbor" in the BGP context throughout.
router bgp	September 14, 1989	BGP can be implemented on a router. The use of "router" as a first command keyword is used throughout the industry by networking equipment vendors, as shown in this Report.
show ip bgp summary	March 9, 1992	"show" commands come from prior legacy CLIs, as discussed elsewhere in this Report. "IP" was described in RFC 791 (1981), as discussed elsewhere in this Report. The "summary" command keyword is commonly used by networking vendors to provide a summarized display of information. The use of the "summary keyword" and this particular command is covered elsewhere in this Report.
neighbor update-source	March 9, 1992	RFC 1105 (June 1989) introduced and discussed the the concept of a BGP "neighbor" in Section 4

		("BGP_Idle state: … In this state BGP refuses all incoming BGP connections. No resources are allocated to the BGP neighbor."). The same RFC also describes "UPDATE" messages in Section 5.
neighbor route-map	January 27, 1993	Constituent command keywords discussed elsewhere in this table and section.
neighbor ebgp-multihop	April 16, 1993	Constituent command keywords discussed elsewhere in this table and section.
show ip bgp regexp	May 10, 1993	Constituent command keywords discussed elsewhere in this table and section.
neighbor next-hop-self	September 24, 1993	"next hop" is a well-known networking term that typically refers to the next router that a data packet should be sent to. In this context, RFC 4271 § 5.1.3 ("NEXT_HOP") states: "The NEXT_HOP is a well-known mandatory attribute that defines the IP address of the router that SHOULD be used as the next hop to the destinations listed in the UPDATE message."
ip as-path access-list	October 7, 1993	RFC 1267 (Oct. 1991) describes "paths" in the BGP context in Section 5. RFC 1652 (July 1994) and RFC 1771 (Mar. 1995) both describe "AS paths" in the BGP context.

aggregate-address	December 2, 1993	RFC 1519 (Sept. 1993) discusses an address assignment and aggregation strategy, noting "rather than advertise a separate route for each such client, the transit domain may advertise a single aggregate route which describes all of the destinations connected to it."
clear ip bgp	1993	"clear" commands come from prior legacy CLIs, as discussed elsewhere in this Report.
distance bgp	1993	Constituent command keywords discussed elsewhere in this table and section.
timers bgp	1993	RFC 1105 (June 1989) introduced the use of BPG "keepalive" and "holdtime" timers in Sections 3.1, 4, and Appendix 1. RFC 1771 (Mar. 1995) includes a more detailed discussion of "BGP Timers" in Section 6.4.
show ip bgp	1993	Constituent command keywords discussed elsewhere in this table and section.
show ip bgp paths	1993	RFC 1267 (Oct. 1991) describes "paths" in the BGP context in Section 5. RFC 1652 (July 1994) and RFC 1771 (Mar. 1995) both describe "AS paths" in the BGP context.
bgp redistribute internal	March 9, 1994	RFC 1771 (Mar. 1995) discusses the re-distribution of routing information within an autonomous system in

		Section 9.2.1.
show ip bgp community	December 16, 1994	Constituent command keywords discussed elsewhere in this table and section.
bgp confederation identifier	February 16, 1995	RFC 1965 (June 1996) (earliest draft is March 1996) discusses "autonomous system confederations for BGP" and the term "AS Confederation Identifier" is defined under "Terms and Definitions".
bgp confederation peers	February 16, 1995	RFC 1965 (June 1996) (earliest draft is March 1996) discusses "peers" in relation to AS confederations in the BGP context (see Abstract and Operation sections).
neighbor send-community	March 1, 1995	Constituent command keywords discussed elsewhere in this table and section.
ip community-list expanded	April 13, 1995	RFC 1997 (Aug. 1996) (first draft in April 1996) is entitled "BGP Communities Attribute" and discusses, in its terms and definitions, BGP communities and "communities listed in the [communities] attribute."
ip community-list standard	April 13, 1995	Constituent command keywords discussed elsewhere in this table and section.
bgp cluster-id	June 30, 1995	RFC 1966 (June 1996) (earliest draft Apr. 1996) discusses "clusters" and a "CLUSTER_ID" in the context of BGP in Section 6.
show ip community-list	July 1, 1995	Constituent command keywords

		discussed elsewhere in this table and section.
neighbor route-reflector-client	July 1, 1995	RFC 1966 (June 1996) (earliest draft Apr. 1996) discusses "route reflection" in the context of BGP. "Client" and "non-client" peers are discussed in this RFC in Section 4.
neighbor password	July 1, 1995	RFC 2385 (Aug. 1998) discusses the use of a password for protection of BGP sessions in Sections 1 and 2.
neighbor peer-group (assigning members)	July 1, 1995	Constituent command keywords discussed elsewhere in this table and section.
neighbor peer-group (creating)	July 1, 1995	Constituent command keywords discussed elsewhere in this table and section.
show ip bgp peer-group	July 1, 1995	Constituent command keywords discussed elsewhere in this table and section.
maximum-paths	July 1, 1995	RFC 1267 (Oct. 1991) describes "paths" in the BGP context.
neighbor default-originate	July 7, 1995	RFC 1397 (Jan. 1993) describes default route advertisement capability in Section 2.
bgp client-to-client reflection	July 12, 1995	RFC 1966 (June 1996) (earliest draft Apr. 1996) discusses "route reflection" in the context of BGP. "Client" and "non-client" peers are discussed in this RFC in Section 4.
neighbor soft-reconfiguration	October 1996	RFC 2918 (Sept. 2000) discusses "a commonly used approach, known as 'soft-reconfiguration'" with respect

		to BGP in Section 1.
neighbor remove-private-as	July 30, 1996	Constituent command keywords discussed elsewhere in this table and section.
neighbor description	September 29, 1997	"Description" is an informational field that can be associated with not only protocols but also with interfaces, access control lists and several other network device configurable features. Several vendors use this command keyword for this purpose. *See, e.g.* Juniper JUNOSe CLI ("ip description"; "neighbor description"; "path description"; "ipv6 description"; and "vlan description" commands); Brocade CLI ("neighbor description"); Dell CLI ("neighbor description").[2]
neighbor timers	November 17, 1997	RFC 1105 (June 1989) introduced the use of BPG "keepalive" and "holdtime" timers in Sections 3.1, 4, and Appendix 1. RFC 1771 (Mar. 1995) includes a more detailed discussion of "BGP Timers" in Section 6.4.
address-family	March 1, 1998	RFC 1700 (Oct. 1994) ("Address Family") defines "address family" and RFC 2283 (Feb. 1998) defines extensions to BGP, and discusses "Address Family" in Section 3.
neighbor shutdown	May 28, 1998	"shutdown" is a feature disablement

[2] Several other vendors also support this CLI command. An analysis of disputed CLI commands supported by other networking vendors is presented separately in this Report, and is intended to complement this analysis.

		keyword used amongst several network equipment vendors to stop the operation of a service, or the deactivation of an interface.
bgp log-neighbor-changes	May 29, 1998	Constituent command keywords discussed elsewhere in this table and section.
neighbor activate	September 30, 1998	Constituent command keywords discussed elsewhere in this table and section.
neighbor local-as	April 29, 1999	RFC 1269 (Oct. 1991) in Section 5 defines an object "bgpLocalAs."
neighbor remote-as	March 11, 1999	
show ip extcommunity-list	September 22, 1999	RFC 4360 (Feb. 2006) (earliest draft Jan. 2002) is entitled "BGP Extended Communities Attribute" and describes the "Extended Communities" attribute in Section 2.
neighbor allowas-in	September 28, 1999	Constituent command keywords discussed elsewhere in this table and section.
ip extcommunity-list expanded	March 30, 2000	Constituent command keywords discussed elsewhere in this table and section.
ip extcommunity-list standard	March 30, 2000	Constituent command keywords discussed elsewhere in this table and section.
neighbor transport connection-mode	February 19, 2004	RFC 1771 (Mar. 1995) discusses BGP's use of TCP as a transport protocol in Section 2. RFC 4271 (Jan. 2006) discusses the different states of a connection being "active"

		and "passive" in Section 8.2.1.
show ipv6 bgp community	April 29, 2005	RFC 2460 (Dec. 1998) specifies the Internet Protocol, Version 6 (IPv6), and RFC 2545 (Mar. 1999) discusses the application of BGP to IPv6.
show ipv6 bgp neighbors	April 29, 2005	Constituent command keywords discussed elsewhere in this table and section.
show ipv6 bgp summary	April 29, 2005	Constituent command keywords discussed elsewhere in this table and section.
show ipv6 bgp	December 22, 2005	Constituent command keywords discussed elsewhere in this table and section.
bgp listen limit	February 12, 2007	RFC 1771 (Mar. 1995) discusses the concept of a limiting for connections from BGP peers in Section 8.

E. Domain Name System ("DNS")

24. The Domain Name System, or DNS, is a distributed database containing host name and IP address information for all domains on the Internet. There is a single authoritative name server for every domain that contains all DNS-related information about the domain, and each domain also has at least one secondary name server that also contains a copy of this information.

25. The concepts, structure, and delegation of the DNS are described in several RFCs, including RFC 1034 and RFC 1591, while domain names and domain name servers are described in several early RFCs, including RFCs 883 and 1035 (both entitled "DOMAIN

NAMES - IMPLEMENTATION AND SPECIFICATION").

26. The following CLI commands in this litigation provide functionality relating to DNS and related concepts (shown in chronological order based on Cisco's purported "earliest document date" for each alleged command):

Disputed "Command"	Earliest Document Date	Additional Opinions
ip name-server	September 14, 1989	"ip" was described in RFC 791 (1981), as discussed elsewhere in this Report. RFC 796 ("The NIC Name Server--A Datagram Based Information Utility") (July 1979) describes "name servers" and RFC 883 ("Domain Names - Implementation and Specification") (Nov. 1983) specifically discusses "the implementation of domain name servers and resolvers."
ip domain-name	1993	RFC 883 ("Domain Names - Implementation and Specification") (Nov. 1983) specifically discusses domain names.
ip domain lookup	1993	RFC 1035 ("Domain Names - Implementation and Specification") (Nov. 1987) uses the common industry terms "look up" and "looks up" to describe the process.

F. Dynamic Host Configuration Protocol ("DHCP")

27. Dynamic Host Configuration Protocol, or DHCP, is described in RFC 2131,

which is titled "Dynamic Host Configuration Protocol" and was published in March 1997 by R. Droms from Bucknell University. Earlier versions of DCHP are described in RFC 1531 and 1541, both of which were published in October 1993 by Droms. The version of DHCP described in RFC 2131 is the version that became the standard for IP version 4 networks.

28. As RFC 2131 states, DHCP provides a framework for passing configuration information to hosts on a TCP/IP network. It is based on the Bootstrap Protocol (BOOTP), adding the capability of automatic allocation of reusable network addresses and additional configuration options. In other words, DHCP is used to dynamically assign IP addresses to host systems.

29. The following CLI commands in this litigation provide functionality relating to the DHCP standard (shown in chronological order based on Cisco's purported "earliest document date" for each alleged command):

Disputed "Command"	Earliest Document Date	Additional Opinions
Both RFC 1531 and RFC 2131, which use the term "DHCP" and describe it, were published before the "earliest document dates" below.		
ip helper-address	April 24, 1989	"ip" was described in RFC 791 (1981), as discussed elsewhere in this Report. The function performed by this command is equivalent to a broadcast packet repeater, as described for example in RFC 947 ("Multi-network Broadcasting within the Internet") (June 1985).
ip dhcp smart-relay	June 23, 2000	Smart-relay permits a router to modify the addressing of DHCP

		request relayed to a DHCP server by using an interface secondary IP address. RFC 3046, RFC 4243, and RFC 6607 each address DHCP Relay Agents.
ip dhcp snooping	April 29, 2002	The concept of snooping is well-known when it appeared in RFC 4541 (May 2006) in application to multicast. RFC 7513 in Section 6 specifically discusses the DHCP Snooping Process.
ip dhcp snooping information option	April 29, 2002	The term "information option" is used in RFCs 3046, 4243, and 6607 to describe "Relay Agent Information option". RFC 3315, section 22.17, addresses "Vendor-specific Information Option".
ip dhcp snooping vlan	April 29, 2002	Constituent command keywords already discussed, except for "vlan," which is discussed further below.
show ip dhcp snooping	April 29, 2002	"show" commands come from prior legacy CLIs, as discussed elsewhere in this Report. Remaining constituent command keywords are discussed elsewhere in this table and section.
show ip helper-address	June 28, 2002	Constituent command keywords discussed elsewhere in this table and section.
ipv6 dhcp relay	February 19, 2004	RFC 3315 at Section 5.3 describes:

destination		"The Relay-reply message may be relayed by other relay agents for delivery to the destination relay agent." Section 20 of RFC 3315 further explains "The relay agent MAY be configured to use a list of destination addresses."
ip dhcp smart-relay global	May 12, 2010	Constituent command keywords discussed elsewhere in this table and section.

G. The Internet Control Message Protocol ("ICMP")

30. The Internet Control Message Protocol, or ICMP, is described in RFC 792, which is titled "INTERNET CONTROL MESSAGE PROTOCOL … DARPA INTERNET PROGRAM PROTOCOL SPECIFICATION" and was published in September 1981 by J. Postel at the Information Sciences Institute at the University of Southern California. RFC 792 obsoleted RFC 777, entitled "Internet Control Message Protocol" and published in April 1981 by Mr. Postel at ISI. ICMP is also discussed in RFC 1122, entitled "Requirements for Internet Hosts -- Communication Layers" and published in October 1989.

31. ICMP is is one of the protocols of the IP suite, is considered part of the IP layer, and is used for error or diagnostic messages that a requested service is not available or that a host or router could not be reached.

32. The following CLI commands in this litigation provide functionality relating to the ICMP standard (shown in chronological order based on Cisco's purported "earliest document date" for each alleged command):

Disputed "Command"	Earliest Document Date	Additional Opinions

ip icmp redirect	January 6, 1999	"ip" was described in RFC 791 (1981), as discussed elsewhere in this Report.

H. Internet Group Management Protocol ("IGMP")

33. The Internet Group Management Protocol, or IGMP, is first mentioned in Section 3 of RFC 988, which is titled "Host Extensions for IP Multicasting" and was published in July 1986 by S. E. Deering at Stanford University. Version 1 of IGMP is described in the subsequently published RFC 1112, which as the same title as RFC 988, and was published in August 1989 by Deering at Stanford. This was followed by RFC 2236, a standards-track RFC entitled "Internet Group Management Protocol, Version 2" and published in November 1997 by W. Fenner of XEROX PARC, and RFC 3376, a standards-track RFC entitled "Internet Group Management Protocol, Version 3" and published in October 2002 by contributors from multiple vendors, including Cereva, Cisco, AT&T, and Ericsson.

34. Additional IETF documents discuss IGMP functionality, including Internet Draft "IGMPv3 and IGMP Snooping switches," the first version of which was published in August 2001, as well as RFC 4541 (May 2006) and RFC 4604 (Aug. 2006). RFC 4604, entitled "Using Internet Group Management Protocol Version 3 (IGMPv3) and Multicast Listener Discovery Protocol Version 2 (MLDv2) for Source-Specific Multicast," updates the description of IGMP in RFC 3376.

35. As described in RFC 3376, IGMP is the protocol used by IP (version 4) systems to report their IP multicast group memberships to neighboring multicast routers. IGMP is also used for other IP multicast management functions. By contrast, multicast

management on IPv6 networks is handled by Multicast Listener Discovery (MLD).

36. I will also refer to the IETF Internet Draft "IGMPv3 and IGMP Snooping switches" (which I will call the "IGMP Snooping Draft") published in August 2001, and publicly available at https://tools.ietf.org/html/draft-ietf-idmr-snoop-00.

37. The following CLI commands in this litigation provide functionality relating to the IGMP standard (shown in chronological order based on Cisco's purported "earliest document date" for each alleged command):

Disputed "Command"	Earliest Document Date	Additional Opinions
clear ip igmp group	1993	"clear" commands come from prior legacy CLIs, as discussed elsewhere in this Report. "ip" was described in RFC 791 (1981), as discussed elsewhere in this Report. RFC 988 (July 1986) first mentions IGMP and its use with IP, and also discusses "group membership" in Sections 3 and 8. RFC 1112 (Aug. 1989), which is IGMPv1, also discusses "IGMP group addresses" and "host groups" in Section 4 nad Appendix 1, and states that "like ICMP, IGMP is an integral part of IP."
ip igmp query-interval	June 24, 1994	RFC 2236 § 3 ("Protocol Description"): "Routers periodically [Query Interval] send a General Query on each attached network for which this router is the Querier, to solicit membership information."

		NOTE: The brackets are part of the RFC.
show ip igmp groups	July 9, 1994	"show" commands come from prior legacy CLIs, as discussed elsewhere in this Report.
show ip igmp interface	July 9, 1994	RFC 988 (July 1986) discusses the "IP Service Interface" at Section 6.1
ip igmp query-max-response-time	March 1996	RFC 2236 (Nov. 1997) § 2.2 ("Max Response Time"): "The Max Response Time field is meaningful only in Membership Query messages, and specifies the maximum allowed time before sending a responding report in units of 1/10 second." Also, § 3 ("Protocol Description"): "A General Query is addressed to the all-systems multicast group (224.0.0.1), has a Group Address field of 0, and has a Max Response Time of [Query Response Interval]. … Each timer is set to a different random value, using the highest clock granularity available on the host, selected from the range (0, Max Response Time] with Max Response Time as specified in the Query packet." (the brackets are part of the RFC)
ip igmp version	March 1996	There are three versions of IGMP: Version 1 (RFC 1112), Version 2 (RFC 2236), and Version 3 (RFC 3376).

ip igmp static-group	January 19, 1997	Constituent command keywords discussed elsewhere in this table and section.
ip igmp snooping	January 4, 1999	IGMP Snooping Draft § 1 ("Introduction"): "In recent years, a number of commercial vendors have introduced products described as 'IGMP snooping switches' to the market." RFC 4286 (Dec. 2005) and 4541 (May 2006) also address IGMP snooping.
ip igmp last-member-query-interval	May 17, 1999	RFC 2236 (Nov. 1997) § 3 ("Protocol Description"): "When a Querier receives a Leave Group message for a group that has group members on the reception interface, it sends [Last Member Query Count] Group-Specific Queries every [Last Member Query Interval] to the group being left. These Group-Specific Queries have their Max Response time set to [Last Member Query Interval]." (the brackets are part of the RFC)
ip igmp last-member-query-count	March 30, 2000	RFC 2236 (Nov. 1997) § 3 ("Protocol Description"): "When a Querier receives a Leave Group message for a group that has group members on the reception interface, it sends [Last Member Query Count] Group-Specific Queries every [Last Member Query Interval] to the group being left. These Group-Specific Queries have their Max Response time set to [Last Member Query Interval]." (the brackets are part of

		the RFC)
ip igmp snooping vlan mrouter	August 2, 2000	RFC 2236 (Nov. 1997) § 2 ("Introduction"): "The Internet Group Management Protocol (IGMP) is used by IP hosts to report their multicast group memberships to any immediately- neighboring multicast routers." Also see RFC 1112 (Aug. 1989) § 2. "mrouter" is a common shorthand term for a multicast router, as used in RFC 2121 (see Section 5) and RFC 2191 (see Section 1). "vlan" is discussed further below in this Appendix.
ip igmp snooping vlan static	August 2, 2000	Constituent command keywords discussed elsewhere in this table and section, and "vlan" is discussed further below in this Appendix.
ip igmp snooping vlan	August 2, 2000	Constituent command keywords discussed elsewhere in this table and section, and "vlan" is discussed further below in this Appendix.
show ip igmp snooping	August 2, 2000	"show" commands come from prior legacy CLIs, as discussed elsewhere in this Report.
show ip igmp snooping mrouter	August 2, 2000	Constituent command keywords discussed elsewhere in this table and section.
ip igmp snooping vlan immediate-leave	September 11, 2000	RFC 2236 discusses a "leave group" event in Section 6 and "fast leave" in Section 10, and "vlan" is discussed

		further below in this Appendix.
ip igmp snooping querier	December 20, 2001	RFC 1112 (Aug. 1989) discusses Host Membership Query messages, while RFC 2236 (Nov. 1997) uses the term "Querier" in the context of IGMP in Section 3.
show ip igmp snooping querier	February 27, 2003	Constituent command keywords discussed elsewhere in this table and section.
show ip igmp snooping groups	August 18, 2003	Constituent command keywords discussed elsewhere in this table and section.
ip igmp startup-query-count	February 11, 2008	RFC 2236 (Nov. 1997) § 3 ("Protocol Description"): "Routers periodically [Query Interval] send a General Query on each attached network for which this router is the Querier, to solicit membership information. On startup, a router SHOULD send [Startup Query Count] General Queries spaced closely together [Startup Query Interval] in order to quickly and reliably determine membership information." NOTE: The brackets are part of the RFC.
ip igmp startup-query-interval	February 11, 2008	RFC 2236 (Nov. 1997) § 3 ("Protocol Description"): "Routers periodically [Query Interval] send a General Query on each attached network for which this router is the Querier, to solicit membership information. On startup, a router

		SHOULD send [Startup Query Count] General Queries spaced closely together [Startup Query Interval] in order to quickly and reliably determine membership information." NOTE: The brackets are part of the RFC.

I. Internet Protocol ("IP")

38. Version 4 of the Internet Protocol, or IP, is described in RFC 791, which is titled "INTERNET PROTOCOL … DARPA INTERNET PROGRAM PROTOCOL SPECIFICATION" and was published in September 1981. RFC 791 indicates that it was prepared by the Information Sciences Institute at the University of Southern California. IP version 4 has been updated by several subsequent RFCs, including RFCs 1349, 2474, and 6864.

39. IP provides services that are roughly equivalent to the OSI Network Layer, and provides a connectionless transport service across the network. While IP has the responsibility to route packets, the population of routing tables with routing information is handled by routing protocols. RIP, OSPF, IS-IS, and BGP, which are also described in this Appendix, are three routing protocols commonly associated with IP and the Internet. RIP, OSPF, and IS-IS are referred to as *interior* gateways protocols because they are primarily used to provide routing within a particular domain, such as within a corporate network or within an ISP's network. By contrast, BGP is an *exterior* gateway protocol because it is used to provide routing information between Internet routing domains.

40. IP has been assigned several version numbers, which can be seen on the IANA website at http://www.iana.org/assignments/version-numbers/version-numbers.xml. IP versions 4 and 6 are the most relevant to this Report. I note that the IANA refers to IP version 4 by the keyword "IP" and IP version 6 by the keyword "IPv6."

41. The official version of IP that has been in use since the early 1980s is version 4. The growth of the Internet in both scale and services, however, precipitated the development of a newer version of IP. In late 1995, IP version 6, which is commonly known as IPv6, entered the Internet Standards Track with the IETF. The primary description of IPv6 is contained in RFC 1883, which was published by the IETF in December 1995 by S. Deering of XEROX Parc and R. Hinden of Ipsilon Networks, and was updated in several subsequent RFCs, including RFC 2460, published in December 1998 by Deering and Hinden. RFC 2460 describes the present IPv6 standard.

42. IPv6 is designed as an evolution from IPv4. Unlike IP version 4 addresses, which are 32 bits in length, IPv6 addresses are 128 bits in length and are written and organized much differently than IP version 4 addresses. For example, IPv6 has better support for traffic types with different quality-of-service objectives, and extensions to support authentication, data integrity, and data confidentiality. The architecture and structure of IPv6 addresses is described in RFC 2373.

43. The following CLI commands in this litigation provide functionality relating to the IP version 4 standard (shown in chronological order based on Cisco's purported "earliest document date" for each alleged command). Note that many commands that include the keyword "ip" may not be listed below (for example, "clear ip arp" and "clear ip bgp", among

others), as they may be listed under and discussed in other sections of this Appendix. However, all of these arguments apply equally to those commands, particularly with respect to common command keywords:

Disputed "Command"	Earliest Document Date	Additional Opinions
*RFC 791 published by the IETF in **1981**.*		
ip address	April 24, 1989	RFC 791 (Sept. 1981) discusses IP, as well as addressing for IP throughout, including Section 2.3. "ip" is a well-known acronym for Internet Protocol, and was a well-known acronym before Cisco existed, as confirmed by Cisco engineers, including Kirk Lougheed, in his deposition. For example, the term "IP address" was used in RFCs 986 and 1069 (both titled "Guidelines for the use of Internet-IP addresses in the ISO Connectionless-Mode Network Protocol") published in June 1986 and Feb. 1989.
ip routing	April 24, 1989	"Routing" as used in this context is in its familiar meaning to networking users of the CLI. RFC 791 (Sept. 1981) uses "routing" in Section 1.4 in the same way: "The selection of a path for transmission is called routing." RFC 1213 (Mar. 1991) ("Management Information Base for

		Network Management of TCP/IP-based internets: MIB-II") also discusses the "IP routing table."
show ip route	April 24, 1989	"show" commands come from prior legacy CLIs, as discussed elsewhere in this Report. See discussion above regarding IP routing.
show ip interface	April 24, 1989	"interface" is used in the ordinary and customary meaning to the networking users of the CLI. RFC 791 (Sept. 1981) Section 1.3 addresses "Interfaces" for the IP protocol. RFC 1213 (Mar. 1991) ("Management Information Base for Network Management of TCP/IP-based internets: MIB-II") also uses the term "IP interface."
ip route	September 14, 1989	*See* discussion above regarding IP routing. This command is used to configure a static route. The term "route"--like "routing" discussed above--is a well known networking term broadly used in this context for CLI commands by many vendors.
ip host	November 7, 1989	The term "host" in the IP context is customary, and the term is used throughout RFC 791 (Sept. 1981).
show ip interface brief	October 31, 1993	*See above discussion*. The use of the term "brief"is used by many vendors in CLI commands to view a

		summary of the router interfaces. This particular command is used by many vendors in the industry.
ip load-sharing	January 19, 1996	This command in Arista switches provides the hash seed to an algorithm that the switch uses to distribute data streams among multiple equal-cost routes to an individual IPv4 subnet. The term "load sharing" describes sharing the load among the data paths. This descriptive command is used by several vendors.
ip access-group	February 28, 1996	The "access-group" and "access-list" family of commands relate to the well-known networking industry use of Access Control Lists. *See* RFC 1983 (Aug. 1996) and RFC 1392 (Jan. 1993) (both entitled "Internet Glossary," and both describing ACLs). Per RFC 1392, "An Access Control List is the usual means by which access to, and denial of, services is controlled. It is simply a list of the services available, each with a list of the hosts permitted to use the service." The ip access-group command in Arista switches applies an IPv4 or standard IPv4 access control list (ACL) to the control plane.
ip access-list	October 1996	*See* discussion of Access Control List above. This command places

		the switch in ACL configuration mode, which is a group change mode that modifies an IPv4 access control list.
ip access-list standard	October 1996	*See* discussion of Access Control List above. The ip access-list standard command places the switch in std-ACL configuration mode, which is a group change mode that modifies a standard IPv4 access control list.
ip prefix-list	June 6, 1998	Prefix lists are used to filter routes for redistribution into OSPF, RIP, or BGP domains. Like the "access-list" family of commands, several vendors support the "prefix-list" family of commands.
ip http client source-interface	November 4, 2002	HTTP is the industry standard acronym for Hypertext Transfer Protocol. Version 1.1 was standardized in RFC 2068 in 1997, followed by RFC 2616 in 1999. This command specifies the source IP address for HTTP connections in Cisco devices. HTTP defines the term "client" in Section 1.3 ("Terminology") as "a program that establishes connections for the purpose of sending requests."
ip protocol	August 26, 2003	This command--at least in Arista's switches--specifies the IP protocol that the switch uses to send probe packet through the configuration

		mode probe transmitter (either TCP or UDP). The functionality and use differs for Cisco devices, but the Cisco usage also appears to be to specify an IP protocol (albeit not for any configuration mode probe transmitter). That use of term "protocol" with respect to IP is customary.
show ip route summary	March 5, 2010	*See* discussion above.
show ip route tag	August 24, 2011	Term "route tag" refers to an optional information field that can be appended to a routing table entry. The use of a "route tag" is a familiar and long-used term that is used in a variety of routing contexts, including OSPF (RFC 1364, Sept. 1992, discussing "[t]he OSPF external route tag") and RIP (RFC 1723, Nov. 1994, discussing the "Route Tag" as additional information for RIP Version 2). The use of a "route tag" here in the IP context is being used in the same way.

44. The following CLI commands in this litigation provide functionality relating to the IP version 6 standard (shown in chronological order based on Cisco's purported "earliest document date" for each alleged command). My opinions stated above for the IP version 4 commands apply equally here, particularly where (as several Cisco witnesses, including Abhay Roy confirmed) the "ip" command syntax was clearly copied for the "ipv6" command

syntax, and the only replacement was "ipv6" for "ip." Note that many commands that include the keyword "ipv6" may not be listed below, as they may be listed under and discussed in other sections of this Appendix (*e.g.*, "ipv6 nd" commands are discussed under the ND section). However, all of these arguments apply equally to those commands, particularly with respect to common command keywords:

Disputed "Command"	**Earliest Document Date**	**Additional Opinions**
RFC 1883 published by the IETF in 1995 describes the IPv6 standard. RFC 2460 (Dec. 1998) also specifies the Internet Protocol, Version 6 (IPv6).		
ipv6 access-list	May 14, 1997	*See* discussion for copied IP version 4 command above.
ipv6 address	May 14, 1997	*See* discussion for copied IP version 4 command above.
ipv6 enable	May 14, 1997	The "enable" keyword, used in this and other disputed commands, is a well-known legacy command word that was used by DEC products to do exactly what the word means--to enable functionality.
ipv6 host	May 14, 1997	*See* discussion for copied IP version 4 command above.
ipv6 route	May 14, 1997	*See* discussion for copied IP version 4 command above.
ipv6 unicast-routing	May 14, 1997	This command enables the forwarding of IPv6 unicast datagrams. SeveralRFCs discuss IPv6 and Unicast routng, including RFC 1887 ("An Architecture for IPv6 Unicast Address Allocation") (Dec. 1995), RFC 2073 ("An IPv6 Provider-Based Unicast Address

		Format") (Jan. 1997), and IETF Internet Draft ("Dynamical routing (unicast and multicast) for the IPv6 protocol") (1997), https://tools.ietf.org/html/draft-fritsche-ipv6-multicast-00.
show ipv6 interface	May 14, 1997	*See* discussion for copied IP version 4 command above.
show ipv6 route	May 14, 1997	*See* discussion for copied IP version 4 command above.
show ipv6 route summary	May 14, 1997	*See* discussion for copied IP version 4 command above.
ipv6 prefix-list	February 4, 2000	*See* discussion for copied IP version 4 command above.
show ipv6 access-list	February 4, 2000	*See* discussion for copied IP version 4 command above.
show ipv6 route tag	February 4, 2000	*See* discussion for copied IP version 4 command above.
show ipv6 prefix-list	June 21, 2000	*See* discussion for copied IP version 4 command above.
ipv6 access-group	November 20, 2006	*See* discussion for copied IP version 4 command above.

J. Intermediate System-to-Intermediate System ("IS-IS") Protocol

45. Intermediate System-to-Intermediate System, or IS-IS, is an interior gateway routing protocol for moving information within an Autonomous System, or AS. A description of an Autonomous System is found in RFC 1930, which describes an AS as the unit of routing policy in the modern world of exterior routing. For example, Border Gateway Protocol, or

BGP, which is an exterior gateway routing protocol, can also be described as an inter-Autonomous System routing protocol.

46. The IS-IS protocol was defined in ISO/IEC 10589:1992 as an international standard within the Open Systems Interconnection (OSI) reference design. ISO/IEC 10589:1992 was first published in November 1992, and ISO/IEC:2002 was published in November 2002. Though originally an ISO standard, the IETF re-published the protocol in RFC 1142, titled "OSI IS-IS Intra-domain Routing Protocol" and published in February 1990 by Digital Equipment Corporation, or DEC. An extension of IS-IS to support the routing of datagrams in IP is described in RFC 1195, titled "Use of OSI IS-IS for Routing in TCP/IP and Dual Environments" and published in December 1990 by DEC.

47. The following CLI commands in this litigation provide functionality relating to the IS-IS protocol (shown in chronological order based on Cisco's purported "earliest document date" for each alleged command):

Disputed "Command"	Earliest Document Date	Additional Opinions
isis hello-interval	March 9, 1992	The acronym "ISIS" appears in RFC 1142 (Feb. 1990) and RFC 1195 (Dec. 1990) (as well as the acronym "IS-IS"--both are used). These RFCs also disclose a Hello Timer and a Hello Rate.
isis metric	March 9, 1992	RFC 1142 (Feb. 1990) discusses "routing metrics" in Sections 6.8.1.1 and 7.2.6.
isis priority	March 9, 1992	RFC 1142 (Feb. 1990) discusses "priority" amongst intermediate systems in Sections 7.2.3 and 8.4.1.

router isis	March 9, 1992	RFC 1195 (Dec. 1990) discusses different types of IS-IS routers, as does RFC 1142 at Section 1.1.
show isis database	June 14, 1992	"show" commands come from prior legacy CLIs, as discussed elsewhere in this Report. RFC 1142 (Feb. 1990) discusses a "Link State Database" in Section 6.8.1.1.
is-type	June 14, 1992	RFC 1142 (Feb. 1990) discusses "Type Bits" that indicate the type of Intermediate System—Level 1 or Level 2 in Section 9.8.
isis hello-multiplier	August 3, 1995	RFC 1142 (Feb. 1990) discloses a "holding multiplier" in connection with a "hello timer" in Section 7.5.1.
isis lsp-interval	May 7, 1996	RFC 1142 (Feb. 1990) discloses managed objects that refer to a minimum LSP transmission interval in Section 11.2.2. "LSP" stands for Link State Protocol Data Unit (see RFC 1142 § 4.2).
show isis topology	June 21, 1998	RFC 1142 (Feb. 1990) discusses "topology information" in Sections 3.6.9 and 6.2.
show isis interface	April 29, 2005	RFC 1195 (Dec. 1990) discusses ISIS "interfaces" in various sections, including Section 4.2.
isis passive	March 26, 2007	Constituent command keywords discussed elsewhere in this table and section.
isis passive-interface	November 7, 2012	Constituent command keywords

		discussed elsewhere in this table and section.

K. Multicast Source Discovery Protocol ("MSDP")

48. Multicast Source Discovery Protocol, MSDP, is described in RFC 3618, which is titled "Multicast Source Discovery Protocol (MSDP)" and was published as an Experimental RFC in October 2003. MSDP, however, was described in several IETF Internet Drafts in the late 1990s, including Internet Draft "Multicast Source Discovery Protocol (MSDP)" published in June 25, 1998 by multiple contributors, including Procket Networks, Cisco Systems, Sprint, UUnet (http://tools.ietf.org/id/draft-farinacci-msdp-00.txt) (I refer to this draft as the IETF MSDP 1998 Draft). Similarly, the first Internet Draft of RFC 3618 was published in December 1999 by the same contributors (https://tools.ietf.org/html/draft-ietf-msdp-spec-00) (I refer to this draft as the IETF MSDP Draft 1999).

49. The following CLI commands in this litigation provide functionality relating to the MSDP standard (shown in chronological order based on Cisco's purported "earliest document date" for each alleged command):

Disputed "Command"	Earliest Document Date	Additional Opinions
clear ip msdp sa-cache	September 21, 1998	"clear" commands come from prior legacy CLIs, as discussed elsewhere in this Report. "ip" was described in RFC 791 (1981), as discussed elsewhere in this Report.

		The term "msdp" appeared in IETF MSDP Draft 1998 (June 1998) IETF MSDP Draft 1998 at Section 4 describes "Source-Active (SA)" messages and the ability to "cache SA state" at Section 4. Caching with respect to SAs is further discussed in IETF MSDP Draft 1999 at Sections 6, 6.1, and 6.1.3.
ip msdp cache-sa-state	September 21, 1998	IETF MSDP Draft 1998 describes the ability to "cache SA state" at Section 4.0. Caching with respect to SAs is further discussed in IETF MSDP Draft 1999 at Section 6.1.1..
ip msdp default-peer	September 21, 1998	IETF MSDP Draft 1999 discloses a "default-peer" at Section 9.1.
ip msdp originator-id	September 21, 1998	IETF MSDP Draft 1999 describes an "MSDP originator"
ip msdp peer	September 21, 1998	IETF MSDP Draft 1998 and 1999 both discuss MSDP "peers" at Sections 3.0 and 5, respectively.
ip msdp sa-filter in	September 21, 1998	IETF MSDP Draft 1999 discusses "SA Filtering" at Section 6.3. RFC 3618 also discusses "SA Filtering" at Sections 7 and 18.
ip msdp sa-filter out	September 21, 1998	*See immediately above.*
show ip msdp sa-cache	September 21, 1998	"show" commands come from prior legacy CLIs, as discussed elsewhere

		in this Report.
show ip msdp summary	September 21, 1998	As discussed elsewhere in this Appendix, the "summary" command is used by many vendors in conjunction with "show" commands to provide summary information.
show ip msdp peer	September 21, 1998	Constituent command keywords discussed elsewhere in this table and section.
ip msdp description	March 3, 1999	The "description" keyword is a commonly used command keyword, as described elsewhere in this Appendix. Constituent command keywords discussed elsewhere in this table and section.
ip msdp shutdown	March 3, 1999	As stated elsewhere in this Appendix, "shutdown" is a feature disablement keyword used amongst several network equipment vendors to stop the operation of a service, or the deactivation of an interface.
ip msdp mesh-group	December 13, 1999	RFP 3618 (Oct. 2003) discloses "MSDP mesh-groups." This term first appears in Internet Draft 06 (July 2000) for RFC 3618 at Section 14.3.
ip msdp sa-limit	January 22, 2001	Limits on SAs are discussed in RFP 3618 (Oct. 2003), Section 18.
ip msdp keepalive	June 27, 2001	IETF MSDP Draft 1999 at Section 6.1.4 discloses a "KeepAlive" timer.
ip msdp timer	July 6, 2001	IETF MSDP Draft 1999 discusses

		MSDP "timers" at Section 6.1.
show ip msdp rpf-peer	April 11, 2003	RFP 3618 (Oct. 2003) discloses and expressly defines an "RPF peer" at Section 3.
ip msdp group-limit	April 29, 2005	Limits on groups are discussed in RFP 3618 (Oct. 2003), Section 18.
show ip msdp mesh-group	October 14, 2007	Constituent command keywords discussed elsewhere in this table and section.

L. Neighbor Discovery ("ND") Protocol

50. Neighbor Discovery, or ND, is described in RFC 4861 (a standards-track document), which is titled "Neighbor Discovery for IP version 6 (IPv6)" and published in September 2007. RFC 4861 obsoleted several prior RFCs that were also entitled "Neighbor Discovery for IP version 6 (IPv6)," including RFC 1970 (which was published in August 1996), and RFC 2461 (which was published in December 1998).

51. ND is a support protocol created for IPv6 to determine the link-layer addresses for neighbors known to reside on attached links and to quickly purge cached values that become invalid. Hosts also use ND to find neighboring routers that are willing to forward packets on their behalf. Finally, nodes use the protocol to actively keep track of which neighbors are reachable and which are not, and to detect changed link-layer addresses. When a router or the path to a router fails, a host actively searches for functioning alternates.

52. The following CLI commands in this litigation provide functionality relating to the ND protocol (shown in chronological order based on Cisco's purported "earliest document

date" for each alleged command):

Disputed "Command"	Earliest Document Date	Additional Opinions
clear ipv6 neighbors	May 14, 1997	"clear" commands come from prior legacy CLIs, as discussed elsewhere in this Report. The term "ipv6" refers to IPv6, described in RFC 1883 (Dec 1995). Term "neighbors" refers to the information learned via ND protocol by a particular host and stored in local cache. This collection process is documented in the RFC 1970 (Aug 1996), in Section 5.1.
ipv6 nd managed-config-flag	May 14, 1997	The term "ipv6" refers to IPv6, described in RFC 1883 (Dec 1995). The term "nd" refers to Neighbor Discovery Protocol (ND), described in RFC 2461 (Dec. 1998), Section 1. The term "managed-config-flag" refers to the 8 bit field reserved for single-bit flags in ND's Router Advertisement (RA) Message, described in RFC 2461 (Dec. 1998) Section 6.2.3.
ipv6 nd ns-interval	May 14, 1997	The term "ns-interval" refers to the retransmission rate of Neighbor Solicitation (NS) messages, this retransmission timer variable is described in RFC 2461 (Dec 1998) as RetransTimer, in Section 7.2.2.
ipv6 nd other-config-flag	May 14, 1997	*See* above discussion of ipv6 nd managed-config-flag.

ipv6 nd reachable-time	May 14, 1997	The term "reachable-time" refers one of the fields contained in every Router Advertisement message, as defined by RFC 2461 (Dec 1998), Section 4.2 ("Reachable Time").
ipv6 nd ra interval	February 4, 2000	The term "ra" refers to the message Router Advertisement, as described in Section 3 of RFC 2461 (Dec. 1998). Other short forms of Router Advertisement can be observed in multiple variable definitions thru the standard. The term "interval" refers to the rate of advertisement of "ra" messages. The ND standard defines variables to control the periodicity of such messages, as described in RFC 2461 (Dec 1998), Section 6.2.6.
ipv6 nd ra lifetime	February 4, 2000	The term "ra" is explained immediately above. The term "lifetime" refers one of the fields contained in every Router Advertisement message, as described in RFC 2461 (Dec 1998), section 4.2 ("Router Lifetime" definition).
ipv6 nd prefix	April 29, 2002	The term "prefix" refers to some of the information parameters that the ND protocol can advertise on its messages. In this particular case the Router Advertisement (RA) has such functionality. The term "prefix" is used in its customary way in RFC 2461 (Dec 1998), Section 3.
ipv6 nd	May 12, 2004	The term "router-preference" refers

router-preference		to an optional extension to Router Advertisement messages for communicating routing information to hosts, as defined in RFC 4191 (Nov 2005), Section 2.2 ("Default Router Preference")
ipv6 nd ra suppress	November 4, 2004	The term "suppress" refers to the ability to disable "ra" responses selectively on a particular interface.

M. Network Address Translation ("NAT")

53. Network Address Translation, or NAT, is described in RFC 1631, which is titled "The IP Network Address Translator (NAT)" and was published in May 1994 by K. Egevang of Cray Communications and P. Francis of NTT. Subsequent RFCs further describe and/or update NAT, including for example RFC 3022. RFC 1631 is an Informational, rather than standards-track RFC, but NAT as described in RFC 1631 has been widely adopted and used across the industry.

54. Generally speaking, NAT is an Internet standard that enables a LAN to use one set of IP addresses for internal traffic, and a different set of IP addresses for external traffic.

55. The following CLI commands in this litigation provide functionality relating to the NAT protocol (shown in chronological order based on Cisco's purported "earliest document date" for each alleged command):

Disputed "Command"	Earliest Document Date	Additional Opinions
clear ip nat translation	April 9, 1996	"clear" commands come from prior legacy CLIs, as discussed elsewhere in this Report.

		"ip" was described in RFC 791 (1981), as discussed elsewhere in this Report. RFC 1347 (June 1992) discusses NAT in the IP context. RFC 2663 at § 1 ("Introduction and Overview") also discusses translation associated with NAT.
ip nat pool	April 9, 1996	RFC 2663 (Aug. 1999) uses the term "pool" in its customary way to describe external addresses at Section 4.1.2.
ip nat translation tcp-timeout	April 9, 1996	RFC 2663 (Aug. 1999) discusses configuring session timeouts for TCP and UDP for NAT devices at Section 2.6. TCP is discussed further in this Appendix.
ip nat translation udp-timeout	April 9, 1996	*See immediately above.* UDP is discussed further in this Appendix.
show ip nat translations	April 9, 1996	"show" commands come from prior legacy CLIs, as discussed elsewhere in this Report.

N. Network Time Protocol ("NTP")

56. Network Time Protocol, or NTP, was first described in RFC 958, which was titled "Network Time Protocol (NTP)" and published in September 1985 by D.L. Mills from M/A-COM Linkabit. The IETF subsequently published several updates to the NTP standard,

including RFC 1059, entitled "Network Time Protocol (Version 1) Specification and Implementation" in July 1988, RFC 1119, entitled "Network Time Protocol (Version 2) Specification and Implementation" in September 1989, and RFC 1305, entitled "Network Time Protocol (Version 3) Specification, Implementation and Analysis" in March 1992. The current NTP standard is defined in RFC 5905, entitled "Network Time Protocol Version 4: Protocol and Algorithms Specification" and published in June 2010.

57. NTP is an Internet protocol used to synchronize the clocks of computers to a time reference. Specifically, NTP is intended to synchronize all participating computers to within a few milliseconds of Coordinated Universal Time (UTC). NTP provides standardized network clock and synchronization functionality that is similar to the IEEE's Precision Time Protocol, or PTP, discussed elsewhere in this Report.

58. The following CLI commands in this litigation provide functionality relating to the NTP standard (shown in chronological order based on Cisco's purported "earliest document date" for each alleged command):

Disputed "Command"	Earliest Document Date	Additional Opinions
show ntp associations	December 29, 1992	"show" commands come from prior legacy CLIs, as discussed elsewhere in this Report. The term "ntp" refers to Network Time Protocol (NTP), described in RFC 958 (Sept. 1985) in Section 1. The term "associations" refers to the number of peers /clients /servers that a particular node is connected to via ntp protocol. The term is used

		several times in the RFC 1119 (Sep 1989), including in Section 3.5 and 3.2.6. The term “associations” is also defined as a standard MIB Object Type in RFC 5907 (June 2010).
show ntp status	January 9,1993	The term “status” refers ot the current operational parameters of the ntp server/client deamon. These parameters are mentioned in the RFC 1119 (Sep 1989) in Section 9.2. The term “status” is also defined as a standard MIB Object Type in RFC 5907 (June 2010) at Section 2 for NTP.
ntp source	August 5, 1993	Term “source” refers to the IP address used to send NTP messages to other peers / clients. Under normal operations the source IP address of an NTP message will default to the value assigned on the interface of the server itself, or to the IP address of the port closest to the peer /client when the server has more than one network adapter. “Source” however is a variable of the NTP message that could be modified and work independently of the address available at the IP layer. It is discussed in Sections 4 and 5.1 of RFC 958 (Sep 1985).
ntp server	October 7, 1993	Term “server” is used to define the name / IP address of a server that could be used to obtain ntp

		information from; the user of this command is typically an "ntp client". RFC 958 (Sept. 1985) § 3 ("Protocol Overview") discusses both "servers" and "clients."
ntp authenticate	December 1, 1993	The term "authenticate" refers to enabling or disabling the authentication feature of ntp as described in RFC 1119 (Sept. 1989) Section 3.2.3.
ntp authentication-key	December 1, 1993	The term "authentication-key" refers to the definition of the "key / passcode / password" to be used while authenticating with other ntp peers, as described in in RFC 1119 (Sept. 1989) at Sections 10 and 10.1.
ntp trusted-key	December 1, 1993	See immediately above. The term "trusted-key" refers to the selection of a specific authentication key that must be matched by an ntp source in order to consider a message as valid. NTP does support multiple types of keys.

O. Open Shortest Path First ("OSPF")

59. Open Shortest Path First, or OSPF, is described in RFC 1131, which is titled "The OSPF Specification" and published in October 1989 by J. Moy of Proteon, Inc. Several subsequent IETF documents followed, including RFC 1247, entitled OSPF Version 2, which was published in July 1991 by Mr. Moy. OSPF Version 2 was further updated by RFC 1349, entitled "Type of Service in the Internet Protocol Suite" and published in July 1992 by P.

Almquist, and RFC 1247 was obsoleted by RFC 1583 (also by Mr. Moy of Proteon, Inc.) in March 1994. Mr. Moy published several more RFCs to update OSPF Version 2, including RFC 2178 (July 1997) and RFC 2328 (Apr. 1998).

60. OSPF for IPv6 is defined in several RFCs, including RFC 2740, which is titled titled "OSPF for IPv6" and was published in December 1999, and RFC 5340, which had the same title and was published in July 2008.

61. OSPF is an interior gateway routing protocol, and more specifically, is a link-state routing protocol. This means that OSPF sends what are called link-state advertisements, or LSAs, to other routers within the same area ("area" being a term that is defined by the OSPF protocol RFCs). OSPF routers used the link-state information in a link-state database to calculate the shortest path to each node.

62. Like RIP, which is also an interior gateway protocol, OSPF is designed to facilitate intra-Autonomous System routing. OSPF, however, was created and designed to scale and provide more robust support for larger Autonomous Systems by dividing each AS into constructs called "areas." Each area is numbered and managed independently as if each was its own AS. In other words, each OSPF "area" is akin to a "sub-AS" within the AS as a whole. This division of an AS into areas by OSPF is referred to as a hierarchical topology.

63. By using a hierarchical topology, the topology of each individual OSPF area is hidden from the rest of the AS, which allows for a substantial decrease in routing traffic across the entire AS. Moreover, by using OSPF in this fashion, routing within each area is determined only by the area's own topology, thereby protecting each area from bad routing data.

64. In addition to the RFCs identified above, there are multiple additional RFCs that describe OSPF functionality, including:

- RFC 1245 (July 1991), entitled "OSPF Protocol Analysis"
- RFC 1248 (July 1991), entitled "OSPF Version 2 Management Information Base"
- RFC 1252 (Aug. 1991), entitled "OSPF Version 2 Management Information Base"
- RFC 1253 (Aug. 1991), entitled "OSPF Version 2 Management Information Base"
- RFC 1364 (Sept. 1992), entitled "BGP OSPF Interaction"
- RFC 1370 (Oct. 1992), entitled "Applicability Statement for OSPF"
- RFC 1403 (Jan. 1993), entitled "BGP OSPF Interaction"
- RFC 1587 (Mar. 1994), entitled "The OSPF NSSA Option" (the first IETF Internet Draft of RFC 1587 was published in Oct. 1992)
- RFC 1745 (Dec. 1994), entitled "BGP4/IDRP for IP"
- RFC 1850 (Nov. 1995), entitled "OSPF Version 2 Management Information Base"
- RFC 2991 (Nov. 2000), entitled "Multipath Issues in Unicast and Multicast Next-Hop Selection"
- RFC 3101 (Jan. 2003), entitled "The OSPF Not-So-Stubby Area (NSSA) Option"
- RFC 5709 (Oct. 2009), entitled "OSPFv2 HMAC-SHA Cryptographic

Authentication"

65. The following CLI commands in this litigation provide functionality relating to the OSPF protocol (versions 2 and 3) (shown in chronological order based on Cisco's purported "earliest document date" for each alleged command):

Disputed "Command"	Earliest Document Date	Additional Opinions
default-metric	January 10, 1988	The term "default-metric" refers to the value that an external route should have as it is injected/redistributed into OSPF protocol. Metric is equivalent to the variable "cost" in ospf. This process of modifying the cost of an external route is documented in the RFC 1247 (July 1991) at Section 2.
passive-interface	April 24, 1989	Term "passive-interface" refers to the ability to selectively suppress the advertisement of ospf messages on any interface (while such interfaces are still considered part of the protocol operation)
ip ospf authentication-key	March 3, 1992	"ip" was described in RFC 791 (1981), as discussed elsewhere in this Report. The term "ospf" refers to the OSPFv2, described in RFC 1247 (July 1991) in Section 1.
ip ospf cost	March 3, 1992	The term "cost" refers to the metric / value assigned to each particular interface / network participating in the ospf process. Cost is defined in RFC 1247 (July 1991), Section 2.

ip ospf dead-interval	March 3, 1992	The term "dead-interval" refers to "RouterDeadInterval" timer variable defined in RFC 1247 (July 1991), Section 9.
ip ospf hello-interval	March 3, 1992	The term "hello-interval" refers to "HelloInterval" timer variable defined in RFC 1247 (July 1991), Section 9.
ip ospf priority	March 3, 1992	The term "priority" refers to the value used by ospf on a per-interface basis to participate in DR/BDR election. This variable is defined in RFC 1247 (July 1991), Section 7.3.
ip ospf retransmit-interval	March 3, 1992	The term "retransmit-interval" refers to "RxmtInterval" timer variable defined in RFC 1247 (July 1991), Section 9.
ip ospf transmit-delay	March 3, 1992	The term "transmit-delay" refers to "InfTransDelay" timer variable defined in RFC 1247 (July 1991), Section 9.
area default-cost (OSPFv2)	March 9, 1992	The term "area" is expressly defined in RFC 1247 (July 1991) in Section 1.1: "OSPF allows sets of networks to be grouped together. Such a grouping is called an area." RFC 1247 at § 6 ("The Area Data Structure"): "StubDefaultCost … If the area has been configured as a stub area, and the router itself is an area border router, then the StubDefaultCost indicates the cost of the default summary link that the router should advertise into the area.

		There can be a separate cost configured for each IP TOS. See Section 12.4.3 for more information."
router ospf (OSPFv2)	March 9, 1992	The syntax "router [protocol]" is common across multiple networking vendors, as shown in other portions of this Report.
default-information-originate (OSPFv2)	March 27, 1992	The term "default-information-originate" refers to the ability of an OSPF router to advertise a default route by itself if a local / external default route exists (i.e. not sourced by OSPF). This process is mentioned in the RFC 1247 (July 1991), in Section 2.2.
area range (OSPFv2)	June 14, 1992	The term "range" refers to the ability of an area border router to summarize routing information: multiple routes into a single advertisement. This process is mentioned in RFC 1247 (July 1991) in Sections 3.4 and 3.5, and the term "area range" is expressly used in Section 3.4.
area stub (OSPFv2)	June 14, 1992	The term "stub" refers to a particular type of ospf area, as expressly defined in RFC 1247 (July 1991) in Section 3.6.
ip ospf network	May 10, 1993	Term "network" refers to the type of layer 2 technology used on a particular interface where ospf runs. The type of layer 2 technology determines the operational mode of

		ospf on such interface. OSPF defines a data structure to store this information on a per interface basis in RFC 1247 (July 1991), Sections 1.2, 2, and 9.
show ip ospf	May 10, 1993	RFC 1247 (July 1991) defines several data structures in Section 5 that store information about the ospf process; this particular command lists information contained in the Protocol Data Structures.
show ip ospf interface	May 10, 1993	Command displays information about OSPF operational information for a specific router interface. RFC 1247 (July 1991) in Section 9 defines several data structures that store information about the ospf process; this particular command lists information contained in the Interface Data Structures as well as Interface State variables.
show ip ospf neighbor	May 10, 1993	Term “neighbor” refers to other network devices participating in the OSPF protocol and some of their operational parameters. These neighbor parameters and their collection are defined in RFC 1247 (July 1991) Section D.2, and Section 10 (“The Neighbor Data Structure”)
show ip ospf border-routers	November 23, 1993	This command displays information about internal routes in a border router. A border router is defined as a router that contains more than one

		topological database in RFC 1247 (July 1991), Sections 3 and 3.3: "[3.3] Area border routers … A router that attaches to multiple areas. Area border routers run multiple copies of the basic algorithm, one copy for each attached area and an additional copy for the backbone. Area border routers condense the topological information of their attached areas for distribution to the backbone. The backbone in turn distributes the information to the other areas."
network area (OSPFv2)	1993	The term "network" refers to the definition of the subnet and area where ospf will be enabled. Multiple subnets can be part of the same area. The process of associating subnets to areas is an essential step in ospf configuration. This is defined in multiple sections of RFC 1247 (July 1991), including Sections 1.1 and 3.5.
show ip ospf database database-summary	November 11, 1994	This command displays information about LSA database for a specific router. The term "database" refers to the list of LSA's exchanged by OSPF routers. The term" database-summary" refers to a particular subset of LSA's defined as the "Database Summary List" in RFC 1247 (July 1991), Section 10.

show ip ospf retransmission-list	November 11, 1994	The term "retransmission-list" refers to a particular subset of LSA's defined as "Link state retransmission list" in RFC 1247 (July 1991), Section 10.
show ip ospf request-list	November 12, 1994	Term "request-list" refers to a particular subset of LSA's defined as "Link state request list" in RFC 1247 (July 1991), Section 10.
ip ospf message-digest-key	July 1, 1995	The term "message-digest-key" enables the utilization of MD5 authentication in ospf interfaces. Interface based authentication is a documented variable in RFC 1247 (July 1991), Sections 9 and E.
ip ospf name-lookup	July 1, 1995	Term "name-lookup" refers to the use of DNS FQD information by other ospf commands (*i.e.* instead of listing ospf nodes by IP address, use their DNS name instead).
maximum-paths (OSPFv2)	July 1, 1995	The term "maximum-paths" refers to the limit of equal cost paths that can be used simultaneously by the protocol to reach a particular destination. RFC 1247 (July 1991) considers the multi-path option for its calculations, as shown in Sections 1.1 and 2.3.
clear ip ospf neighbor	March 1996	Constituent command keywords discussed elsewhere in this table and section.
area nssa (OSPFv2)	April 5, 1996	RFC 1587 (Internet Draft Draft 00) (Oct. 1992) at Abstract: "This

		document describes a new optional type of OSPF area, some-what humorously referred to as a 'not-so-stubby' area (or NSSA). NSSAs are similar to the existing OSPF stub area configuration option but have the additional capability of importing AS external routes in a limited fashion."
area nssa default-information-originate	April 5, 1996	Term "default-information-originate refers to the ability of an ospf "border router" to generate a default route while participating in an nssa area. This parameter is part of the operation of an ospf "nssa", and it is described in the RFC 1587 (Mar 1994) in Section 2.2.
area nssa no-summary	September 16, 1996	Term "no-summary" refers to a type of ospf LSA/update "type-3" which should not be propagated within an nssa area. This condition is mentioned in the RFC 1587 (Mar 1994) at Section 3.4.
show ipv6 neighbors	May 14, 1997	"show" commands come from prior legacy CLIs, as discussed elsewhere in this Report. The term "ipv6" refers to IPv6, described in RFC 1883 (Dec 1995).
log-adjacency-changes	October 12, 1998	The term "log-adjacency-changes" refers to the ability of a ospf router to display or store changes in the router adjacency process (i.e. intitial discovery and handshake)
router-id	November 2, 1998	The term "router-id" refers to

		"Router ID" variable defined in RFC 1247 (July 1991), Section 1.2.
ipv6 router ospf	February 4, 2000	The term "ospf" refers to OSPFv3, described in RFC 2740 (Dec 1999). The term "router" enables the operation of OSPF version 3 protocol. RFC 2740 uses the term "router" multiple times to describe the platform that is running such routing protocol.
ip ospf authentication	March 2, 2000	The term "authentication" refers to the type of security used by ospf to exchange information with other neighbors (such as a key/ password protected framework), as defined in the RFC 1247 (July 1991), Section 6.
show ipv6 ospf	June 4, 2001	Constituent command keywords discussed elsewhere in this table and section.
show ipv6 ospf border-routers	August 31, 2001	Constituent command keywords discussed elsewhere in this table and section.
show ipv6 ospf interface	August 31, 2001	Constituent command keywords discussed elsewhere in this table and section.
show ipv6 ospf neighbor	August 31, 2001	Constituent command keywords discussed elsewhere in this table and section.
ipv6 ospf area	August 31, 2001	As stated in RFC 2740 (Dec 1999) (see Abstract), ospf for ipv6 (also called ospf version 3) retains the fundamental mechanisms of ospf as

		already discussed for ospf for IP version 4. The explanations for terms like "area," "cost," and other defined ospf terms for ospf version 2 remain the same for ospf version 3.
ipv6 ospf cost	August 31, 2001	Constituent command keywords discussed elsewhere in this table and section.
ipv6 ospf dead-interval	August 31, 2001	Constituent command keywords discussed elsewhere in this table and section.
ipv6 ospf hello-interval	August 31, 2001	Constituent command keywords discussed elsewhere in this table and section.
ipv6 ospf network	August 31, 2001	The term "network" permits the definition of network-type field for ospfv3 on a particular interface.
ipv6 ospf priority	August 31, 2001	Constituent command keywords discussed elsewhere in this table and section.
ipv6 ospf retransmit-interval	August 31, 2001	Constituent command keywords discussed elsewhere in this table and section.
ipv6 ospf transmit-delay	August 31, 2001	Constituent command keywords discussed elsewhere in this table and section.
maximum-paths (OSPFv3)	August 31, 2001	RFC 2740 (Dec 1999) at Abstract: "All of OSPF for IPv4's optional capabilities, including on-demand circuit support, NSSA areas, and the multicast extensions to OSPF

		(MOSPF) are also supported in OSPF for IPv6."
passive-interface (OSPFv3)	August 31, 2001	Constituent command keywords discussed elsewhere in this table and section.
timers throttle spf	March 27, 2002	Constituent command keywords discussed elsewhere in this table and section. "SPF" is a well known industry acronym for "shortest path first" (same as the "SPF" portion of "OSPF"). SPF calculations occur at the interval set by this command.
ipv6 neighbor	April 9, 2002	Constituent command keywords discussed elsewhere in this table and section.
default-information originate (OSPFv3)	June 25, 2002	Constituent command keywords discussed elsewhere in this table and section.
area default-cost (OSPFv3)	June 25, 2002	Constituent command keywords discussed elsewhere in this table and section.
default-metric (OSPFv3)	June 25, 2002	Constituent command keywords discussed elsewhere in this table and section.
clear ipv6 ospf force-spf	October 9, 2002	Term "force-spf" refers to the ability to trigger an immediate recalculation of the spf algorithm
timers lsa arrival	December 11, 2002	LSA is a known acronym for "link state advertisement." Constituent command keywords discussed elsewhere in this table and section. This command controls the

		minimum interval for accepting the same LSA.
timers throttle lsa all	December 11, 2002	Constituent command keywords discussed elsewhere in this table and section. This command controls the generation (sending) of LSAs.
area nssa translate type7 always (OSPFv2)	March 17, 2003	The term "translate type-7" refers to the process taken by an ospf nssa border router to convert one type of LSA into another. This process is defined in RFC 1587 (Mar 1994) at Section 2.2. The term "always" defines that such translation should happen at all times, equivalent to an enable/disable action.
area nssa translate type7 always (OSPFv3)	March 17, 2003	Constituent command keywords discussed elsewhere in this table and section.
ip ospf bfd	May 1, 2004	Term "bfd" refers to Bidirectional Forwarding Detection, defined in RFC 5880 (June 2010).
area nssa (OSPFv3)	November 7, 2005	Constituent command keywords discussed elsewhere in this table and section.
area nssa default-information-originate (OSPFv3)	November 7, 2005	Constituent command keywords discussed elsewhere in this table and section.
area range (OSPFv3)	November 7, 2005	Constituent command keywords discussed elsewhere in this table and section.
area stub (OSPFv3)	November 7, 2005	Constituent command keywords discussed elsewhere in this table and section.

ip ospf shutdown	September 19, 2006	Constituent command keywords discussed elsewhere in this table and section. As discussed elsewhere in this Appendix, "shutdown" is a feature disablement keyword used amongst several network equipment vendors to stop the operation of a service, or the deactivation of an interface.
router-id (OSPFv3)	July 25, 2011	RFC 2740 OSPF for IPv6 (Dec 1999), does not modify value / function of this variable. It operates as a regular OSPF version 2 parameter, per Section 2.2 of RFC 2740.

P. Protocol Independent Multicast ("PIM")

66. Protocol Independent Multicast, or PIM, was created in the 1994 to 1995 time period, but the first version (version 1) of the PIM protocols were not standardized by the IETF. The earliest cited publication for PIM in the IETF Internet Drafts is March 1994.[3] PIM is a collection of multicast routing protocols, each optimized for a different environment. There are two main PIM protocols: (1) PIM Sparse Mode ("PIM-SM") and (2) PIM Dense Mode ("PIM-DM"). A third PIM protocol, Bidirectional PIM, is described in RFC 5015. All PIM protocols share a common control message format.

67. Multicast itself has been discussed in IETF RFCs and has been term known ot the networking industry since at least December 1985, in RFC 966 ("Host Groups: A

[3] The IETF Internet Draft for PIM version 2 (RFC 2117) (specifically, the Internet Draft of PIM-SM Specification available at https://tools.ietf.org/html/draft-ietf-idmr-pim-sm-spec-00) cites as References several publications by the authors of the RFC, including S. Deering, D. Estrin, D. Farinacci, and V. Jacobson, *Protocol independent multicast (pim), dense mode protocol : Specification*, Internet Draft, March 1994.

Multicast Extension to the Internet Protocol"). Other multicast-related RFCs were also published in the 1980s. *See, e.g.* RFC 1075 ("Distance Vector Multicast Routing Protocol DVMRP") (1988).

68. While version 1 of PIM-SM was not standardized, version 2 of PIM-SM was standardized in RFC 2117, which is titled "Protocol Independent Multicast-Sparse Mode (PIM-SM): Protocol Specification" and was published in June 1997. This version of PIM was then updated by RFC 2362, which had the same title, in June 1998. Subsequent RFCs, including RFC 4601 (August 2006) and RFC 7761 (Mar. 2016) provided further updates and revisions to PIM-SM.

69. Similarly, while version 1 of PIM-DM was not standardized, version 2 of PIM-DM was described in RFC 3973, which is titled "Protocol Independent Multicast - Dense Mode (PIM-DM): Protocol Specification (Revised)" and was published in January 2005. Prior to RFC 3973, several IETF Internet Drafts also described PIM-DM, including for example the Internet Draft at https://tools.ietf.org/html/draft-ietf-idmr-pim-dm-spec-01, which is titled "Protocol Independent Multicast-Dense Mode (PIM-DM): Protocol Specification" and was published in January 1996, as well as the four subsequent drafts that followed it.

70. The following CLI commands in this litigation provide functionality relating to the PIM protocols (shown in chronological order based on Cisco's purported "earliest document date" for each alleged command):

Disputed "Command"	Earliest Document Date	Additional Opinions
ip pim sparse-mode	June 24, 1994	"ip" was described in RFC 791 (1981), as discussed elsewhere in this Report.

		The term "pim" refers to Protocol Independent Multicast, described in RFC 2117 (June 1997), but as noted above, described in publications dating back to March 1994. The term "sparse-mode" refers to a type of PIM implementation (contrast against "dense-mode"), as discussed above. "Sparse Mode" is defined in RFC 2117 (Jun 1997) (see Introduction).
ip pim query-interval	June 24, 1994	The term "query-interval" refers to the rate of messages an RP router sends/collects via IGMP. This variable "Query Interval" is defined in RFC 2236 (Nov. 1997) at Section 8.2.
show ip pim interface	July 9, 1994	"show" commands come from prior legacy CLIs, as discussed elsewhere in this Report. Interface specific variables / metrics for PIM are part of the MIB Definitions listed within RFC 5060 (Jan. 2008).
show ip pim neighbor	July 9, 1994	Neighbor specific variables / metrics for PIM are part of the MIB Definitions listed within RFC 5060 (Jan. 2008).
show ip pim rp	July 9, 1994	RP specific variables / metrics for PIM are part of the MIB Definitions listed within RFC 5060 (Jan. 2008). RP is the defined acronym for

		Rendezvous Point, sa discussed elsewhere in this table and in RFC 2117 (June 1997).
ip multicast-routing	July 9, 1994	Multicast routing is an industry term discussed in several RFCs, including for example RFC 1075 (“Distance Vector Multicast Routing Protocol”) (Nov. 1988), https://tools.ietf.org/pdf/rfc1075.pdf. This widely used command is not specific to PIM, but simply enables IP multicast routing.
ip pim rp-address	October 4, 1994	The term “rp-address” refers to the IP address of the Rendezvous Point, defined in RFC 2117 (June 1997), and is used and discussed in Section 2.1. RPs are discussed in Section 2.6. The term “RP Address” is also a very common term used in multicast, and its configuration implies the use of an IP address as an identifier.
ip pim spt-threshold	December 17, 1995	SPT used in this context is a known industry acronym for “shortest-path tree.” The term “spt-threshold” is used by several vendors, including Juniper, for commands relating to this PIM functionality.
ip pim spt-threshold group-list	December 17, 1995	Constituent command keywords discussed elsewhere in this table and section.
ip multicast boundary	March 1996	The term “boundary” is technical term used in the context of multicast

		routers and protocols. For example, RFC 2117 at § 2.7 refers to the "boundary of a PIM-SM domain."
ip pim neighbor-filter	January 22, 1997	Constituent command keywords discussed elsewhere in this table and section.
ip pim bsr-candidate	April 3, 1997	The term "bsr-candidate" is described in RFC 2117 (June 1997) (drafts are earlier) at Section 3.6 (discussing Candidate BSRs).
ip pim rp-candidate	April 3, 1997	The term "rp-candidate" is discussed in RFC 2117 (June 1997) at Section 2.6 (discussing Candidate RPs).
show ip pim rp-hash	April 3, 1997	The term "rp-hash" refers to the mapping between a particular multicast group to a particular RP router. The RP hashing mechanism is documented in the RFC 2117 (1997), at Section 3.7.
ip pim dr-priority	August 4, 1999	The acronym "dr" refers to Designated Router, defined in RFC 2117 (June 1997) at Section 2. The term "dr-priority" refers to a variable used for DR selection process. That variable is described both in RFC 2117 (June 1997) at Section 2.9 and in the MIB Definitions for PIM within RFC 5060 (Jan. 2008) at Section 5.
ip pim register-source	September 9, 1999	The term "register-source" refers to the ability of changing the source ip address used when sending register messages. The RFC 2117 (June

		1997) describes this in Sections 2 and 4.
ip pim bsr-border	October 13, 1999	The term "bsr-border" refers to the ability of a Bootstrap Router (bsr) to transmit or not bootstrap messages on a particular interface. The acronym "bsr" and its operation is defined in the RFC 2117 (June 1997) at Section 2.6. The term "border" refers to a bsr router that is located at the edge of a multicast domain (also known as PIM Multicast Border Router (PMBR)). This type of router is described in RFC 2117 (June 1997) at Section 2.7. The term "bsr-border" is also defined in the MIB Definitions for PIM within RFC 5060 (Jan 2008).
ip pim ssm range	February 24, 2000	The term "ssm range" defines the range of IP addresses to be used for multicast. SSM is a known industry acronym for Source-Specific Multicast. This acronym, and the use of an SSM range, is discussed in RFC 3569 (Jul 2003).
ip pim log-neighbor-changes	August 9, 2004	The phrase "log neighbor changes" in this and other disputed commands describes exactly what it does—it logs when a "neighbor" (a common networking industry term discussed throughout this Appendix) changes in status (*e.g.*, resets or goes down).

ip pim anycast-rp	April 29, 2005	The term "anycast-rp" refers to anycast rendevous point, described in RFC 3446 "Anycast Rendevous Point (RP) mechanism using Protocol Independent Multicast (PIM) and Multicast Source Discovery Protocol (MSDP)" (Jan 2003).
ip pim bfd	November 11, 2009	Term "bfd" refers to Bidirectional Forwarding Detection, defined in RFC 5880 (June 2010).
ip pim bfd-instance	March 1, 2010	Term "bfd" refers to Bidirectional Forwarding Detection, defined in RFC 5880 (June 2010). The phrase "BFD instance" is a common phrase in the networking industry to reference to an instance of BFD on a router.

Q. Routing Information Protocol ("RIP")

71. Routing Information Protocol, or RIP, is described in RFC 1058, which is titled "Routing Information Protocol" and was published in June 1988 by Chuck Hedrick from Rutgers University. RFC 1058, which the IETF has now characterized as Historical, was then updated and superseded by RFC 1388 and 1723. RFC 1388, a standards-track RFC titled "RIP Version 2 … Carrying Additional Information" was published in January 1993 by G. Malkin of Xylogics, Inc., and was obsoleted by RFC 1723, published in November 1994 by Malkin. Several subsequent RFCs updated RIP, including RFC 2453, which was published by Malkin in November 1998.

72. Generally speaking, RIP sets forth a mechanism for how neighboring routers

within an Autonomous System, or AS, exchange routing table information. As described in RFC 2453, RIP is a routing protocol based on the Bellman-Ford (or distance vector) algorithm. This algorithm has been used for routing computations in computer networks since the early days of the ARPANET. As discussed elsewhere in this Report, Cisco engineer Kirk Lougheed acknowledged in his deposition that RIP was widely used in the networking industry years before any RFC described it.

73. RFC 2453 further explains that in an international network, such as the Internet, it is very unlikely that a single routing protocol will used for the entire network. Rather, the network will be organized as a collection of ASs, each of which will, in general, be administered by a single entity. Each AS will have its own routing technology, which may differ among ASs. The routing protocol used within an AS is referred to as an interior gateway protocol, while a separate protocol, called an exterior gateway protocol, is used to transfer routing information between each AS. RIP was designed to work as an IGP in moderate-size AS. Other IGPs include OSPF and IS-IS, both of which are described in this Appendix.

74. The following CLI commands in this litigation provide functionality relating to the RIP standard (shown in chronological order based on Cisco's purported "earliest document date" for each alleged command):

Disputed "Command"	Earliest Document Date	Additional Opinions
router rip	September 19, 1987	The first RFC to describe "RIP" and describe its use with IP is RFC 1058 (June 1988). The convention of using "router" as

		a first keyword is shared by many networking vendors, as shown elsewhere in this Report.
timers basic (RIP)	September 14, 1989	RFC 1058 (June 1988) defined and described the use of RIP network timers at Page 23 ("There are two timers associated with each route…").
ip rip v2-broadcast	December 2, 1995	"ip" was described in RFC 791 (1981), as discussed elsewhere in this Report. "V2" refers to Version 2 of RIP. RFC 2453 (Nov. 1998) describes and defines "broadcasts" for RIP version 2 in Sections 3.9.1 and 5.1.
show ip rip database	May 4, 1998	"show" commands come from prior legacy CLIs, as discussed elsewhere in this Report.
show interfaces description	September 18, 2000	The common command keywords "interfaces" and "description", which are used by many vendors, are discussed elsewhere in this Appendix.
show ip rip neighbors	August 27, 2010	RFC 1058 (June 1988) at Section 2 discusses and uses the term "neighbors" in the context of RIP.

R. Simple Network Management Protocol ("SNMP")

75. Simple Network Management Protocol, or SNMP, is described in several RFCs published by the IETF, starting with RFC 1065 ("Structure and identification of management

information for TCP/IP-based internets"), RFC 1066 ("Management information base for network management of TCP/IP-based internets"), and RFC 1067 ("A simple network management protocol"). RFCs 1065 and 1066 were published in August 1988 by TWG (The Wollongong Group), and RFC 1067 was published in August 1988 by a multitude of contributors.

76. These RFCs were obsoleted and/or supplemented by several subsequent RFCs:

- RFC 1098 ("A Simple Network Management Protocol (SNMP)") (Apr. 1989)
- RFC 1155 ("Structure and Identification of Management Information for TCP/IP-based Internets") (May 1990)
- RFC 1156 ("Management Information Base for Network Management of TCP/IP-based internets") (May 1990)
- RFC 1157 ("A Simple Network Management Protocol (SNMP)") (May 1990)
- RFC 1213 ("Management Information Base for Network Management of TCP/IP-based internets: MIB-II") (Mar. 1991)
- RFC 1452 ("Coexistence between version 1 and version 2 of the Internet-standard Network Management Framework") (Apr. 1993)
- RFC 1901 ("Introduction to Community-based SNMPv2") (Jan. 1996)
- RFC 1902 ("Structure of Management Information for SNMPv2") (Jan. 1996)
- RFC 1908 ("Coexistence between Version 1 and Version 2 of the

Internet-standard Network Management Framework") (Jan. 1996)

- RFC 2570 ("Introduction to Version 3 of the Internet-standard Network Management Framework") (Apr. 1999)
- RFC 2578 ("Structure of Management Information Version 2 (SMIv2)") (Apr. 1999)
- RFC 3410 ("Introduction and Applicability Statements for Internet Standard Management Framework") (Dec. 2002)
- RFC 3411 ("An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks") (Dec. 2002)
- RFC 3412 ("Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)") (Dec. 2002)
- RFC 3413 ("Simple Network Management Protocol (SNMP) Applications") (Dec. 2002)
- RFC 3414 ("User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)") (Dec. 2002)
- RFC 3415 ("View-based Access Control Model (VACM) for the Simple Network Management Protocol (SNMP)") (Dec. 2002)
- RFC 3416 ("Version 2 of the Protocol Operations for the Simple Network Management Protocol (SNMP)") (Dec. 2002)
- RFC 3417 ("Transport Mappings for the Simple Network Management Protocol (SNMP)") (Dec. 2002)

- RFC 3418 ("Management Information Base (MIB) for the Simple Network Management Protocol (SNMP)") (Dec. 2002)
- RFC 3430 ("Simple Network Management Protocol (SNMP) over Transmission Control Protocol (TCP) Transport Mapping") (Dec. 2002)
- RFC 3584 ("Coexistence between Version 1, Version 2, and Version 3 of the Internet-standard Network Management Framework") (Aug. 2003)
- RFC 3826 ("The Advanced Encryption Standard (AES) Cipher Algorithm in the SNMP User-based Security Model") (June 2004)
- RFC 5343 ("Simple Network Management Protocol (SNMP) Context EngineID Discovery") (Sept. 2008)
- RFC 5590 ("Transport Subsystem for the Simple Network Management Protocol (SNMP)") (June 2009)
- RFC 5591 ("Transport Security Model for the Simple Network Management Protocol (SNMP)") (June 2009)
- RFC 5592 ("Secure Shell Transport Model for the Simple Network Management Protocol (SNMP)") (June 2009)
- RFC 5608 ("Remote Authentication Dial-In User Service (RADIUS) Usage for Simple Network Management Protocol (SNMP) Transport Models.") (Aug. 2009)
- RFC 6353 ("Transport Layer Security (TLS) Transport Model for the Simple Network Management Protocol (SNMP)") (July 2011)

- RFC 7630 ("HMAC-SHA-2 Authentication Protocols in the User-based Security Model (USM) for SNMPv3") (Oct 2015)

77. The following CLI commands in this litigation provide functionality relating to SNMP (shown in chronological order based on Cisco's purported "earliest document date" for each alleged command):

Disputed "Command"	Earliest Document Date	Additional Opinions
no snmp-server	April 24, 1989	"no" commands come from prior legacy CLIs, as discussed elsewhere in this Report. RFC 1067 (Aug. 1988) Section 3 describes the SNMP architectural model, and contemplates the use "management stations" that reflect a client./server model.
snmp-server community	April 24, 1989	Term "community" refers to a variable string used for membership, as expressly described in RFC 1067 (Aug. 1988) Sections 3.2.5 and 4. "community" is also defined as a variable /object tracked within the Management Information Base for SNMPv2, described in RFC 1907 (Jan. 1996).
snmp-server host	April 24, 1989	The term "host" refers to the identity of appliance acting as a snmp server/client (*i.e.* hostname or ip address of node receiving snmp messages). The term "host" is defined in RFC 1514 (Sept. 1993) at Abstract.

snmp-server contact	June 14, 1992	The term "contact" refers to information stored in a network device detailing the person responsible for its control, and is defined in RFC 1907 (Jan. 1996) ("sysContact").
snmp-server location	June 14, 1992	Constituent command keywords discussed elsewhere in this table and section.
show snmp	August 4, 1992	"show" commands come from prior legacy CLIs, as discussed elsewhere in this Report.
snmp-server chassis-id	February 28, 1993	Constituent command keywords discussed elsewhere in this table and section.
show snmp mib	July 22, 1993	The term "mib" is a well-known industry acronym that refers to management information base, defined in RFC 1067 (Aug 1988). The MIB describes the attributes of a particular platform accessible via SNMP.
snmp trap link-status	November 11, 1993	The term "link-status" refers to the trap generated when an interface goes up/down. The interface status MIB was defined in RFC 2233 (Nov. 1997).
snmp-server view	August 8, 1994	Constituent command keywords discussed elsewhere in this table and section.
snmp-server enable traps	November 29, 1994	Terms "enable traps" refers to activating unsolicited snmp messages (traps).

show snmp view	July 4, 1995	The term "view" refers to the term ViewTreeFamily defined in RFC 2575 (Apr. 1999) at Section 2.4.2.
show snmp chassis	December 6, 1996	The term term "chassis" refers to serial number information of the snmp server /device hosting snmp process..
show snmp contact	December 6, 1996	Constituent command keywords discussed elsewhere in this table and section.
show snmp location	December 6, 1996	The term "location" refers to information stored in a network device detailing its placement. The term "location" is also defined RFC 1907 (Jan. 1996).
show snmp community	March 12, 1997	Constituent command keywords discussed elsewhere in this table and section.
show snmp group	August 5, 1998	The term "group" in this command displays the number of SNMP groups configured on a particular system along with other informational attributes. The term "group" here lso refers to the collection of MIB objects that are common to all managed systems. *See* RFC 1907 ("snmpMIBGroups").
show snmp user	August 5, 1998	The term "user" refers to the authentication mode used with snmp and the information that links users with a particular engineID. User-based authentication for SNMP was defined in RFC 1910 (Feb.

		1996).
snmp-server user	August 5, 1998	Constituent command keywords discussed elsewhere in this table and section.
snmp-server engineID local	October 19, 1998	The term "engineID" refers to the snmpEngineID variable described in RFC 2261 (Jan 1998) and RFC 1907 (Jan. 1996) Section 3.1.1.1.
snmp-server engineID remote	October 19, 1998	Constituent command keywords discussed elsewhere in this table and section.
show snmp engineID	October 19, 1998	Constituent command keywords discussed elsewhere in this table and section.
show snmp host	October 19, 1998	Constituent command keywords discussed elsewhere in this table and section.
snmp-server group	November 3, 1998	Constituent command keywords discussed elsewhere in this table and section.
snmp-server source-interface	August 3, 2004	Constituent command keywords discussed elsewhere in this table and section.
show snmp trap	January 24, 2008	The term "trap" refers to unsolicited snmp messages sent by network elements. Trap messages are defined in RFC 1067 (Aug 1988) at Sections 3.2.3 and 4.1.6. "Trap" is also defined as a variable /object tracked within the Management Information Base for SNMPv2, described in RFC 1907

		(Jan. 1996).
show snmp source-interface	December 1, 2008	The term "source-interface" (which appears in at least one other disputed commands) refers to the ability to override the source IP address for all snmp packets transmitted.

S. Transmission Control Protocol ("TCP")

78. Transmission Control Protocol, or TCP, is described in RFC 793, which is titled "TRANSMISSION CONTROL PROTOCOL … DARPA INTERNET PROGRAM PROTOCOL SPECIFICATION" and was published in September 1981. RFC 793 indicates that it was prepared by the Information Sciences Institute at the University of Southern California.

79. RFC 793 states that TCP is intended for use as a highly reliable host-to-host protocol between hosts in packet-switched computer communication networks, and in interconnected systems of such networks. Although TCP can run over a variety of network layer protocols, it most commonly runs over IP and is therefore often called "TCP/IP."

80. TCP is discussed in relation to several commands, including "ip nat translation tcp-timeout." TCP in that command refers to the industry standard acronym "TCP." "Timeout" is a common networking term discussed and used in early RFCs, including RFC 908 (July 1984) at Section 3.4.4. ("Retransmission Timeout").

T. User Datagram Protocol ("UDP")

81. User Datagram Protocol, or UDP, is described in RFC 768, which is titled "User Datagram Protocol" and was published in August 1980. RFC 768 indicates that it was

prepared by Jon Postel from the Information Sciences Institute at the University of Southern California.

82. RFC 768 states that UDP is defined to make available a datagram mode of packet-switched computer communication in the environment of an interconnected set of computer networks, and assumes that IP is used as the underlying protocol.

83. UDP is discussed in relation to several commands, including "ip nat translation udp-timeout." UDP in that command refers to the industry standard acronym "UDP." "Timeout" is a common networking term discussed and used in early RFCs, including RFC 908 (July 1984) at Section 3.4.4. ("Retransmission Timeout").

U. Virtual Router Redundancy Protocol ("VRRP")

84. Virtual Router Redundancy Protocol, or VRRP, is described in RFC 2338, which is titled "Virtual Router Redundancy Protocol" and was published in April 1998 by multiple contributors from Ascend Communications, Microsoft, Nokia, DEC, and IBM. VRRP is further described in subsequent RFCs, including RFC 3768, entitled "Virtual Router Redundancy Protocol (VRRP)" and published in April 2004, and in RFC 5798, entitled "Virtual Router Redundancy Protocol (VRRP) Version 3 for IPv4 and IPv6" and published in March 2010.

85. Generally speaking, VRRP is an Internet protocol that provides a way to have one or more backup routers when using a statically configured router on a local area network (LAN). As described in the RFCs, VRRP specifies an election protocol that dynamically assigns responsibility for a virtual router to one of the VRRP routers on a LAN. The VRRP router controlling the IP address(es) associated with a virtual router is called the Master, and

forwards packets sent to these IP addresses. The election process provides dynamic fail over in the forwarding responsibility should the Master become unavailable.

86. The following CLI commands in this litigation provide functionality relating to the VRRP standard (shown in chronological order based on Cisco's purported "earliest document date" for each alleged command):

Disputed "Command"	Earliest Document Date	Additional Opinions
show vrrp	June 9, 2000	"show" commands come from prior legacy CLIs, as discussed elsewhere in this Report. The "vrrp" acronym is used and defined in RFC 2338 (Apr. 1998).
vrrp authentication	June 9, 2000	*See* RFC 2338 (Apr. 1998) at § 5.3.6 ("Authentication Type").
vrrp ip	June 9, 2000	"ip" was described in RFC 791 (1981), as discussed elsewhere in this Report.
vrrp ip secondary	June 9, 2000	The terms "track" and "secondary" are both well-known terms used to monitor interfaces/events before taking a corrective action ("track"), and also used to include additional IP addresses into a particular interface/service ("secondary").
vrrp preempt	June 9, 2000	RFC 2338 (Apr. 1998) at § 6.1.2 ("Parameters per Virtual Router") discusses "Preempt_Mode", which [c]ontrols whether a higher priority Backup router preempts a lower priority Master."

vrrp priority	June 9, 2000	RFC 2338 (Apr. 1998) at § 6.1.2 ("Parameters per Virtual Router"): defines "Priority … Priority value to be used by this VRRP router in Master election for this virtual router."
vrrp timers advertise	June 9, 2000	RFC 2338 (Apr. 1998) at §§ 6.1.2 and 6.2 both discuss "advertisements" in the VRRP context.
vrrp track	June 9, 2000	The terms "track" and "secondary" are both well-known terms used to monitor interfaces/events before taking a corrective action ("track"), and also used to include additional IP addresses into a particular interface/service ("secondary").
vrrp description	June 4, 2001	As noted elsewhere in this Appendix, the "description" keyword can be associated with not only protocols but also with interfaces, access control lists and several other network device configurable features. Several vendors use this keyword/command.
vrrp shutdown	March 5, 2004	As noted elsewhere in this Appendix, the "shutdown" keyword is commonly used as a feature disablement keyword.
vrrp delay reload	July 8, 2009	RFC 2338 at § 8.2 ("Host ARP Requests") discusses delay functionality.